

SCIENCE

FRIDAY, JANUARY 25, 1889.

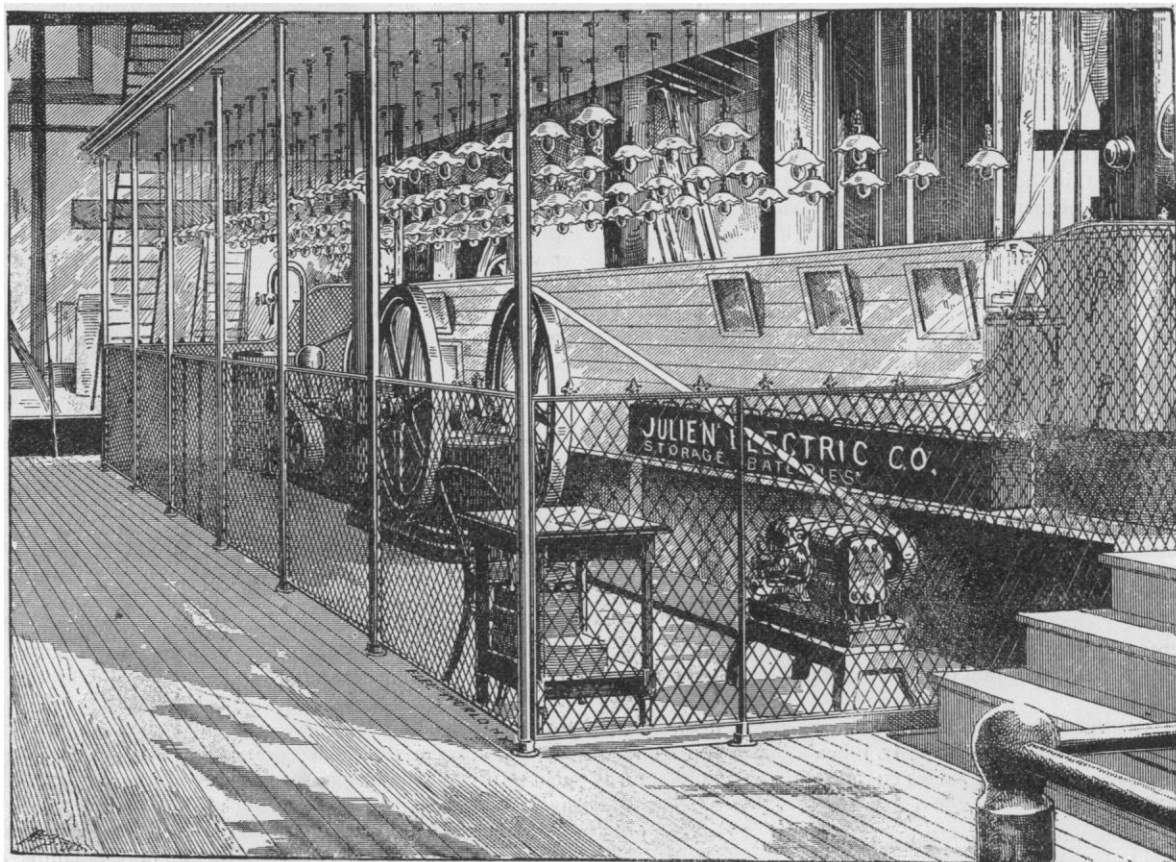
THE STORAGE OF ELECTRICITY.

ONE of the greatest drawbacks to the introduction of electricity as a servant of man has heretofore been a method of providing a suitable means of accumulating it, so as to have it at hand when and where wanted. The development of storage-batteries is doing as much to-day to advance the universal adoption of electricity as the dynamo when invented did to introduce it.

To Gaston Planté, more than to any other investigator, are we indebted for our knowledge of storage-batteries. He it was who

above, the plates of metallic lead become gradually converted into spongy lead on the negative pole, and peroxide of lead on the positive pole, and that such a cell would hold current and deliver it again with but small loss. The chief reason that a storage-battery of this character could not be made of use practically, was the fact that to form the lead plates it was necessary to pass the charging current daily back and forth by a series of reversals for many months before they became converted to their new forms.

On the discovery and perfecting of the mechanical production of electricity by means of the dynamo, the production of a suitable form of storage immediately became one of the leading questions of the day; but how this formation of Planté's plates might be has-



JULIEN STORAGE-BATTERY EXHIBIT AT THE AMERICAN INSTITUTE FAIR.

first took advantage of secondary currents in voltaic batteries. He examined the entire problem of the polarization of electrodes, using all kinds of metals as electrodes or plates, and many different liquids as electrolytes; but he found that the greatest efficiency was produced by electrodes of lead in diluted sulphuric acid.

The first set of Planté cells was exhibited in 1860, before the Paris Academy of Sciences. It was immediately recognized that the storage-battery had a field peculiarly its own, and that its application was only limited by the application of electricity. This was all before the introduction of the dynamo; and at that time little real commercial value was attached to the discovery, as the accumulators had to be charged by means of primary batteries, and it was then well known that electricity, when produced by chemical means, was far too expensive for any purpose outside of the laboratory.

Mr. Planté's discovery consisted of the fact, that, if a current of electricity be passed back and forth through a pile composed as

tened, so as to reduce the cost of manufacture within practical limits, was what was first to be solved. The first step forward was the artificial application of the oxides found on Planté's plates to sheets of lead which were bound on by strips of felt. After a short time, however, under the action of the sulphuric acid, these strips of felt became eaten, and the surface of the plates fell away.

It remained for Mr. Edmond Julien, a Belgian engineer, to make a battery of such a form as to be electrically and mechanically suited to the requirements. His battery consists of perforated plates or grids, into which are pressed the active materials or oxides, which, after a short charge, become almost one homogeneous mass, being what Planté in a crude way produced by the continuous action of a series of reversals of a current. This, however important, did not turn out to be his most valuable invention. When put to practical use, it was found that after a short time the positive plates showed signs of corrosion, which limited their life to about one year. He therefore entered upon the work of construct-

ing a battery free from its defects, and, after a period of six years of continuous experimenting, he produced the Julien battery in its present form (represented in the accompanying cut), founded upon the principle of an inoxidizable support plate, which is materially opposed to that employed by his predecessors. All support plates made before Mr. Julien's discovery were founded on the principle of the oxidization of the positive plates or their conversion into peroxide, so that they soon fell to pieces.

The difference between a lead plate and one composed of this inoxidizable alloy — lead, antimony, and mercury — is perfectly evident: one is practically useless, while the other can be successfully used for years. The importance of this point is made plain by a recent decision of the commissioner of patents.

The following is an extract from the report of Benton J. Hall, commissioner, Dec. 8, 1888, in the case of an interference between John S. Sellon, assignor to the Electrical Accumulator Company, and Edmond Julien:—

"The addition of mercury as a battery constituent is of great value in the formation of support plates of secondary batteries, on account of its tendency to unite with the other metal or metals of the plate, forming a more active union or contact between the plate which contains an admixture of mercury, and thus diminishing the resistance of the electrode, and therefore the resistance of the whole battery, thereby increasing the current, which is a result of the greatest importance in the use and application of secondary batteries.

"This property (that of diminishing the resistance of the electrodes) is so valuable, that, in the manufacture of plates for contact batteries, the addition of mercury to alloys of lead and antimony gives marked advantages over batteries formed of lead and antimony alone, and renders them preferred for secondary-battery purposes. This is the characteristic value of the Julien battery, or the triple alloy battery of Julien, which is so much preferred in modern use on account of its durability and efficiency.

"The action of mercury in the three-element battery — that of Julien — should at once remove it from comparison with two-metal batteries of any kind as yet known, and which appears to be due to the admixture of mercury in the alloy, which renders it unlike the other batteries with which it is classified wrongly in this interference, and with which it should not have been placed in interference; for the presence of mercury in the plate gives it a distinct and separate place, and forms a different alloy."

These plates, in addition to being inoxidizable, and thus having practically an unlimited life, are of great rigidity and mechanical durability, which enables them to be made very much lighter, and also prevents any tendency of bending, or, as it is called, "buckling," under the severe strain of heavy rates of charge and discharge.

To illustrate the difference in weight between a battery whose plates are made of pure lead and of Mr. Julien's compound, I quote from pamphlets issued by companies engaged in the manufacture of these batteries:—

	Weight of Cell in Pounds.	Capacity in Ampère Hours.	Capacity per Pound.
Gibson (lead).....	120	200	1.6
Faure (lead)	121	300	2.5
Julien (alloy).....	32	150	4.7

The value of Mr. Julien's inventions was immediately recognized by capitalists in America, which resulted in the organization of the Julien Electric Company, to exploit his systems of traction and lighting by means of these batteries. To that company is due the great progress which has been made within the last two years in the storage-battery industry. American ingenuity and proclivity for labor-saving machinery has grappled with and overcome almost all the difficulties in the manufacture of these batteries, which, up to a short time ago, had been considered insurmountable.

The plates were at first cast, pasted, and pressed entirely by hand, and, in fact, these crude methods are still in use in Europe

and by all other makers in this country; but the Julien Company have a machine capable of producing in one day one thousand completely finished plates. It is almost automatic in its action, and requires but one attendant. All the plates are uniform, and the action of the battery is therefore free from the irregularities inseparable from hand-made batteries.

A word as to the application of storage-batteries. They have been extensively and successfully used for the following purposes: electric lighting of buildings of every description; lighting of railway-trains, street-cars, and omnibuses; the traction of all vehicles, more especially street-cars; the propulsion of yachts, launches, and pleasure-boats; the lighting of steam-vessels, etc.; running motors of all kinds; telegraphy, signalling, etc.; medical uses; electroplating; general laboratory-work, etc.

Electric lighting, however, is one of its most interesting and useful applications. It is here that its functions as a reservoir of energy become utilized to the greatest advantage.

Where lights are supplied direct from a dynamo, the machinery must have a power-capacity equal to the maximum number of lamps in a given installation; and, since the lights are usually only needed a few hours out of each twenty-four, the plant will remain idle the rest of the time. Moreover, to secure first-class results, the engine and dynamo must be of the best construction and design, steady and quick regulating, to prevent flickering. But with storage-batteries the generator is not limited as to the time or manner of working, but can prepare its supply slowly, ahead of time, during the day, in the many hours at its disposal; and, in addition to its requiring a dynamo of very much smaller size, the machinery may be of much simpler and cheaper construction, as with the battery irregularities in movement can exist without in any way affecting the quality of the light, since the current given off from the accumulators is always uniform and regular, even while the charging current is subject to marked fluctuations. The storage-battery is, in fact, an equalizer and regulator to the dynamo, besides acting as a reservoir in case of accident, which is liable to happen with the best machinery.

In all cases a direct lighting-plant can be made complete and perfectly reliable by the addition of storage-batteries, as the surplus energy, which can be stored while the dynamo is running under light load, can be utilized during the remaining hours of the day or night.

With water we cannot expect a reliable supply without providing suitable facilities for accumulating and storing certain quantities of it; and in every case we have such means of storage, whether it be a reservoir, tank, cistern, or well. With gas the supply must be yet more uncertain and unreliable without the gasometer, in which the product of the retorts can be stored ahead of the time of consumption. In the profitable and practical application of electricity we must also have a means of storing to insure an absolutely steady and uniform current, so necessary with incandescent lighting, and also to provide against any possibility of the extinguishing of the lights by failure of the generating-plant.

Another great advantage to be obtained from the use of storage-batteries is the great increase in the life of the lamps, due to the fact that the current flows with absolute steadiness at all times, thus adding from twenty-five to fifty per cent to their life, and effecting a great saving, for the renewal of lamps is one of the chief items of expense in the maintenance of an installation.

They can, for example, be charged without trouble and danger from an arc as well as incandescent circuit. Thus the electric light may be introduced in many places where a special generating-plant for charging batteries could not be employed, or where its expense would be objectionable. This permits of the introduction of incandescent lighting without too great initial cost of installation, or in the subsequent running expense.

In places where an arc circuit is already installed, the introduction of the incandescent light becomes a comparatively simple and inexpensive matter. The arc dynamo can be used in the day-time to charge the batteries, and at night to supply the arc lamps, while the stored electrical energy is used to supply incandescent lamps.

What one generation looks upon as a luxury the next regards as a necessity. Of the numerous applications of the inventions utilized during the present century for the promotion and extension of

the comforts and luxuries of life, there has been, perhaps, nothing more wonderful than the improvements in the methods of obtaining and utilizing light.

As lately as fifty years ago the candle was the chief illuminant in use. This was replaced by the oil-lamp, which was undoubtedly a great step in the way of progress. A little later this luxury made way for gaslight. But progress could not stop here. Having been educated to a proper appreciation of good light, the public, not satisfied with this improvement, demands that gas, in turn, shall make room for some other agent. The electric light has proved itself the only agency for the accomplishment of the difficulty of still further improvement.

Among its manifold advantages are, —

The great superiority and steadiness of the light.

It does not over-heat the atmosphere, nor charge it with poisonous gases, while depriving the air of its life-sustaining element, oxygen.

It also removes all danger to life and health caused by the escape of gas.

Ventilation, a matter of such vital importance to health and life, thus becomes a comparatively simple matter, the difficulties in this direction no longer increasing in inverse ratio to the amount of light used, as with gas.

The safety it offers over every other form of light, removing the ever-present danger of fire, by doing away entirely with the use of the match. By simply touching a button or turning a switch, any designated light or all the lights in a house can be lit from any part of the building. They also admit of a much more advantageous distribution of light.

The cost of insurance where electric light is used is in all cases reduced.

Its freedom from smoke and deleterious gases, which work such incalculable destruction to ceilings, walls, decorations, books, paintings, etc., makes its adoption the greatest possible saving. But, great as has been its success, its introduction into general use has been limited, as it has not been placed within the reach of all. It has been shut out from the very place where good light is most needed and appreciated, "at home," owing entirely to the method of producing it, — that of lighting direct from a dynamo.

The electric lighting of houses distant from a central lighting-station has heretofore, to a certain extent, been an impossibility, owing chiefly to the fact that a steam-plant has been necessary, and that in the production of electric light direct from a dynamo it has been impossible to obtain light except when the dynamo is running.

The operation of a steam-engine necessitates the presence of an experienced engineer, which immediately makes its production so expensive as to be beyond the reach of any but the more wealthy.

The time when light is most required in a private house is between the hours of six and ten or twelve o'clock at night, when it is almost impossible to obtain the services of a competent engineer.

The noises and vibrations attending the operation of a steam-engine have been another drawback to its introduction, for few are willing to have machinery in operation in a private house until after the hour of midnight or during the time when light is required.

There has been no means of producing electric light with the direct lighting method so that light may be available at all times except by the running of a dynamo continuously, and, unless light can be available at all times, it fails to compete with gas.

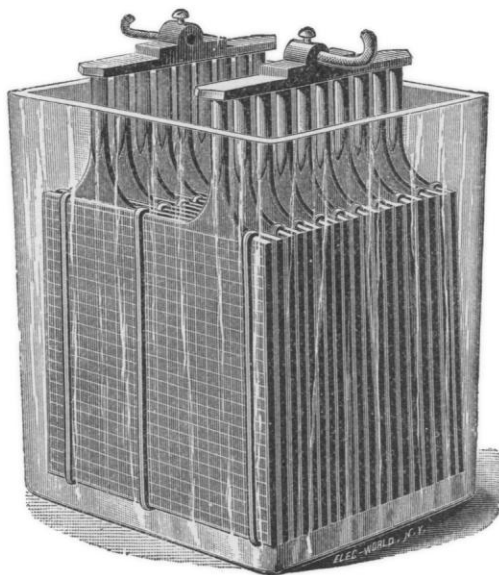
The storage-battery, however, seems to overcome all these difficulties, and to solve the problem of incandescent lighting in isolated cases.

In the course of some remarks recently made before an electric-light association by a prominent New York electrical engineer, the importance of storage-batteries in electric lighting was very clearly shown in the following: "I would call the attention of the members, for instance, to the lighting of private residences which are detached, country residences, summer residences, and large mansions. I believe that here the storage-battery has a sphere which it will hold as its own, for the reason that the direct system of lighting of today does not afford all the requisites of a perfect application of electricity for lighting. It has not supplanted gas, and you will find

that wherever isolated plants are in use to-day they still have gas. Now, I do not consider that we can look upon isolated lighting as a success until we see it drive gas out altogether. To do that, we must have electricity 'on tap' for twenty-four hours a day, the same as gas, and I can conceive of no system by which this can be done successfully except one involving the use of storage-batteries as an accessory, if nothing more."

A storage-battery can be charged with the use of almost any form of power during the hours of the day, and in many instances energy now running to waste may be utilized in laying up a supply for night use.

One of the interesting developments in this connection is the prominence of the gas-engine as a producer of electric light. This power seems to be particularly fitted for work in connection with storage-batteries. The operation of these engines is so simple that they can be cared for and run by the employees of almost any house. The power is always available. The gas in the engine is ignited by a spark from the battery, and, in fact, can be started by simply turning a battery switch, using the dynamo for a moment



THE JULIEN STORAGE-BATTERY.

as a motor to bring the engine up to speed. Thus by the simple operating of a switch the entire plant is set in motion. The battery is charged during the day, and at night, when the engine is shut down, enough energy will have been stored to supply the house with light for the entire night.

The accompanying illustration represents one of the most interesting displays at the American Institute Fair this season, the installation of the Julien Electric Company, showing the application of storage-batteries to the lighting of private residences in connection with a Baldwin gas-engine and a United States dynamo. The plant consisted of a 4-horse-power gas-engine coupled to a 30-light dynamo and 36 cells of Julien battery. There were in the exhibit some 95 16-candle-power lamps, in addition to two $\frac{1}{4}$ -horse-power electric motors used for operating a fan and sewing-machine, — another application to family needs. The current from the battery can also be used for pumping water, the running of electric bells, burglar alarms, and other light work. The dynamo charges the battery during the day; and at night, when the full number of lights is turned on, the dynamo takes care of 30 lights, and the remaining 65 are taken from the accumulators. It will thus be seen, that, in addition to serving as a reservoir to be called on when the plant is not in operation, by the running of the dynamo, and at the same time discharging from the battery, a largely increased number of lamps is available, thus reducing very considerably the amount of power necessary to be introduced. It is generally acknowledged that light derived from storage-batteries is of greater steadiness than that produced direct, thus increasing considerably the life of the lamps.

The cell employed was the type 19 C of the Julien Company, weighing complete about 44 pounds, which is rated by that company as having a capacity of 200 ampère-hours, and the rate of discharge given is 30 ampères. It will be seen, however, that, as these lamps take about $\frac{1}{10}$ of an ampère each, the batteries were being discharged at about twice their normal rate, and, where occasion required, the engine was stopped and the batteries supplied current for the entire plant, thus discharging at almost three times their nominal rate.

This is a particularly creditable showing for these batteries. The principal difficulty heretofore in the use of accumulators has been that they have not been permitted to be discharged at a greater rate than from about one-tenth to one-eighth of their capacity, whereas in this exhibit they were regularly required to deliver their full capacity in about four hours.

The cells were in use from the commencement of the exhibition, the 1st of October, until Dec. 15, and did not in that time require the least attention on the part of the company, the plant being run entirely by a man in charge of the gas-engines, who, until the opening of the fair, had never been in charge of an accumulator plant.

The lights were burned four hours each night, which, discharging at the rate of about 60 ampères, and occasionally at 80 to 85, made a total of 250 ampère hours taken out, while the rated capacity (discharging at the nominal rate) is but 200 ampère hours. This is an indication of the large amount of reserve energy there is always on hand in case of an accident or stoppage of the generating-plant, or in case of an emergency.

A BLIZZARD MEETS AN ELECTRIC ROAD.

RECENTLY one of the severest tests to which an electric railroad can be subjected was experienced by the Davenport Electric Line, installed by the Sprague Electric Railway and Motor Company of New York, at Davenport, Io., and one which proves most conclusively that an electric railway can be operated even under the most adverse conditions of weather. The blizzard, which had been howling about the Dakota prairies during the first part of the week, and getting up its strength by snowing in the territory farmers, decided to come south, and on Jan. 9 struck the city of Davenport.

The snow, which was of the heavy damp variety, fell all day, and covered the streets to the depth of from four or five inches to one foot on a level, and in several places caused deep drifts over the line of the electric railway. In spite of this, the cars on the electric line kept running uninterruptedly, carrying a large number of passengers, and proving conclusively that no amount of snow could prevent the cars from running on schedule time. The president of the road, Mr. W. L. Allen, was greatly pleased with the signal triumph of the Sprague people, who had told him in the autumn that snow could not interfere with the operation of the road, and is enthusiastic over electric railways.

This road has been in operation about four months, and has been giving very great satisfaction to the management and citizens of Davenport, who have had a much better service since its installation than they ever had while the road was being operated by horses. The cars move faster, are under quicker and more perfect control, and are much more easily managed than the cars drawn by animal power. The regular Sprague overhead system, with small No. 6 silicon-bronze wire as a working conductor, is in use upon this road. All the latest devices and improvements adopted by the Sprague Company for facilitating the operation and increasing the convenience of their electric roads are in use here.

Among the principal points of excellence of the Sprague system of electric railway, may be mentioned the system of conducting current to the cars by means of a working conductor, separate from the main conductor, but connected to it at intervals by automatic cut-outs, by which an accident on any portion of the line does not interfere with the remainder of the road; the use of flexible suspension for the motors, preventing accident from sudden strain; and the method of controlling the motors from either platform without the use of idle resistance.

TESTING A PNEUMATIC DYNAMITE GUN.

ON Saturday last a test was made of the capabilities of a pneumatic gun of fifteen inches bore, forty feet in length, intended to throw a shell containing 700 pounds of dynamite and nitro-gelatin. Two shots were fired, when, owing to the leakage of an air-valve, the experiments were postponed to some future time. As far as the trial went, the results were satisfactory. A mile from the gun, which was located at Fort Lafayette, in the Narrows, New York Bay, a rectangular space 50 by 100 feet was marked off in the waters of Gravesend Bay by four buoys. The first projectile from the gun passed about 250 yards beyond the target, though it was an excellent line shot. Its course was easily followed by the unaided eye from the moment it left the gun until it entered the water. It passed through the air as though shot from a rifled gun, without an oscillation or a "wobble." It exploded a moment after striking the surface, throwing up the water, like an immense fountain, from 100 to 200 feet into the air. This first projectile contained 170 pounds of dynamite.

The second projectile, containing 200 pounds of dynamite and 300 pounds of nitro-gelatin, a larger charge than had ever been used before, fell short of the mark, but the effects of its explosion were tremendous. A reversed Niagara, of water, mud, and stones, shot perhaps 200 feet into the air. It seemed as though a water-volcano had broken forth in Gravesend Bay.

The reason for this shell not reaching the target appeared to be that there was some defect in the tail-piece, which is depended upon to keep it from oscillating or wobbling in its flight. Some part of this tail-piece was evidently injured in leaving the gun, and the consequence was that the longitudinal axis of the projectile (which was six or seven feet in length) deviated from the line of flight. It swung through an angle of about forty degrees, back and forth, while describing the arc of flight, the oscillation decreasing as the projectile approached the water.

Further tests of the gun are promised in the near future, and they will be watched with interest, as the dynamite gun is destined to take an important place in the warfare of the future.

THE RISLEY AND LAKE COMPOSING-MACHINE.

THERE is now on exhibition at No. 22 Spruce Street, this city, a machine intended to dispense with the use of type in certain kinds of printing. It is the invention of Messrs. Risley and Lake; and though only an experimental machine, and therefore somewhat imperfect in many of its details, it does its work speedily and well. The printing done by it is not as perfect or as pleasing to the eye as ordinary letterpress work, but is good enough to satisfy the requirements of that important branch of the printer's art known as law printing, in which small editions of lawyers' briefs, legal arguments, evidence, etc., are desired in a few hours' time.

This machine, in its present crude but very promising stage of development, is shown in the accompanying illustration. As a satisfactory description of it cannot be given unless the machine be seen in operation, only a few of its features will be touched upon here. Though not so complicated as the engraving makes it appear, still many of the mechanical movements involved are so novel that they must be seen before they can be readily understood.

It will be perceived that there is a key-board like that of an ordinary type-writer, the use of which is obvious. There is a key for each character used. These characters are all cast or cut on one cylindrical shell or sleeve, in which feature the machine resembles the well-known Crandall type-writer. This type-shell may be seen, in the illustration, at the centre of the machine, immediately to the rear of the key-board, and in front of the sheet of paper upon which the printing is to be done. One peculiar feature of this machine is, that the printing does not begin until the keys for about fifty characters have been struck, so that the operator is always at least a line ahead of the impressions as they appear on the paper. The keys, instead of acting directly upon the printing apparatus, act upon a set of pins, which are carried in a revolving disk; each key, when depressed, setting its appropriate pin in position for actuating the printing mechanism when the disk shall have carried it around to the proper point. In this way there are always stored

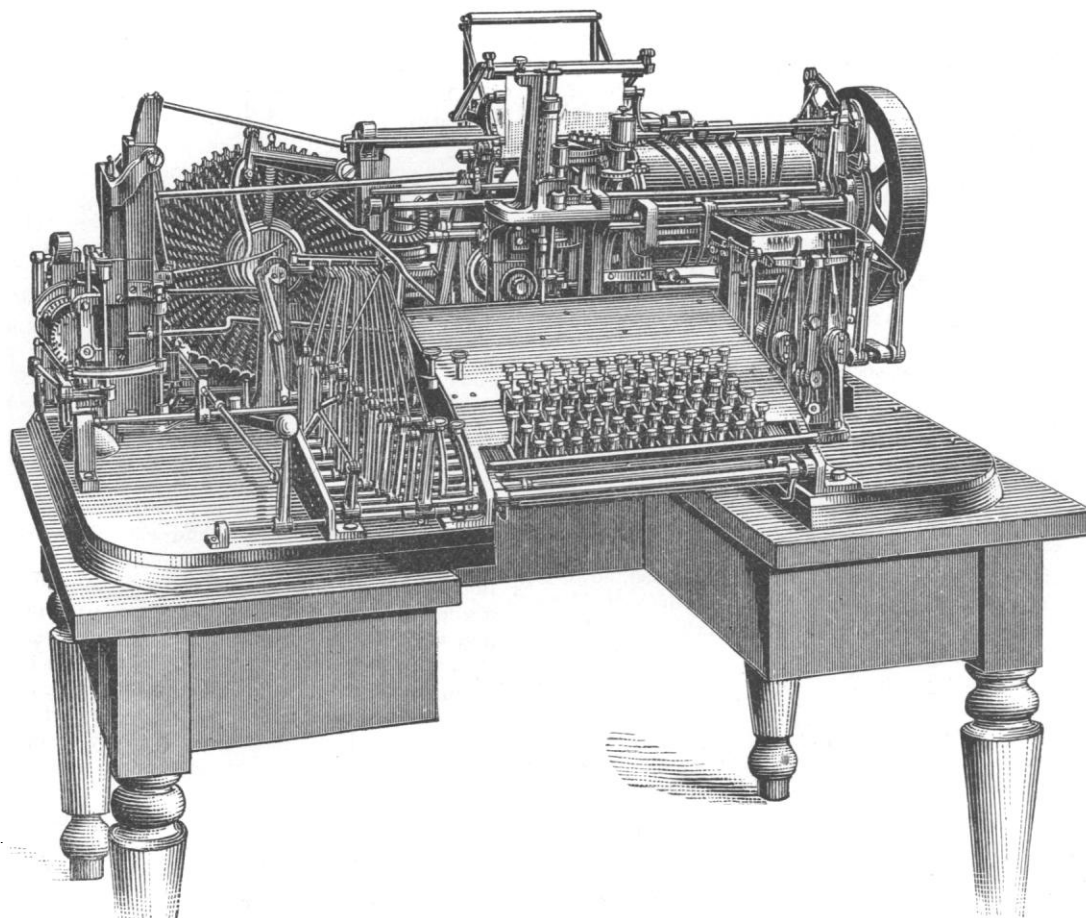
up, as it were, ready for use, fifty or more characters, and these are made to appear upon the paper, in proper place and order, by the automatic action of the machine, even after the operator ceases work at the key-board.

A unique feature of the invention is that by which the lines are "justified;" that is, lengthened or shortened to conform to the width of the column or page. To do this, when movable types are used, as in ordinary type-setting, the compositor, when the line is nearly completed, puts thicker or thinner spaces between the words. Otherwise the lines would be unequal in length, presenting a ragged appearance, similar to that of type-written work. By an ingenious device upon this machine, when a sufficient number of words to approximately fill a line have been registered or "pinned" upon the revolving disk, the justifying or spacing between the words is done automatically; and when the words subsequently appear upon the paper, they fill the line as accurately as do the words in

city, who are now erecting extensive workshops for its manufacture. The chief moving spirit in the enterprise of bringing it to the front and putting it upon a commercial basis is Mr. Edward F. Underhill, official stenographer of the New York Surrogate's Court, who has had it in use in his office for several months, with highly satisfactory results.

METHYLATED ALCOHOL.¹

THE employment of alcohol so adulterated as to render it unfit for use as a beverage, free of tax, in the arts and manufactures, has lately been receiving attention by Congress. To prevent fraud on the revenue, the degree of adulteration that would be permitted should be governed by two considerations, — first, the minimum amount of adulterant that should be added to make the subsequent purification of the alcohol unprofitable; and, second, the maximum



RISLEY AND LAKE COMPOSING-MACHINE.

this line, and the spacing between the words is as even as it could be made by the most expert compositor. In fact, the spacing is, and must of necessity be, mathematically correct.

The reproduction of the work done on the machine now on exhibition is accomplished by lithography. The printing by the machine is done with lithographic ink on paper specially prepared. The impression is then transferred to stone in the usual manner, and the desired number of copies struck off. The first printing or composing on the machine is done in less than a fourth of the time required when movable types are used, the ordinary speed being from twenty to twenty-five words a minute. The cost of transferring to stone is said to be less than the "making up" of forms for the press in ordinary printing, and there is no "distribution" of type.

This machine has also been tested with a view to making matrices for the casting of stereotype plates, but the experiments have not been carried sufficiently far, as yet, to determine what may be accomplished by it in that direction. The patents covering the machine are controlled by the Graphic Process Company of this

amount of adulterant that can be added without rendering the use of such adulterated alcohol unsuitable in the arts and manufactures.

Compounds known as methylated spirits, made by adulterating pure grain spirits, free of tax, with wood naphtha (methyl alcohol), are more expensive than such pure spirits, because the adulterant is, contrary to what is usual in such cases, more costly than the article adulterated.

For most manufacturing purposes, the addition of any amount of adulterant to grain alcohol must be regarded as just so much added useless matter. Besides, there is no purpose for which methylated spirits is used where the employment of grain alcohol would not yield both a cleaner and better product; in addition, there are many cases in which methylated spirits cannot be used at all.

Let us see what has been done in this matter in England and Germany, where laws and regulations on the subject have been enacted.

¹ Paper read before the Chemical Society of Washington, Jan. 10, 1889, by Edgar Richards.

Great Britain.

In England, according to the definition of their regulations and law, "the spirits must be plain spirits or unsweetened foreign spirits, of not less strength than 50 per cent over proof, or rum of not less strength than 20 per cent over proof, and must be mixed with at least one-ninth of their bulk of wood naphtha. This mixture is termed 'methylated spirits.'" Accordingly, 10 per cent is the amount of added impurity.

The Board of Inland Revenue only permits the use of a decidedly impure and crude wood naphtha for this purpose, of a not "less strength than 60 over proof," and which must not be used until a sample has been submitted and approved by the chemical department of Somerset House. Until the necessary approval has been obtained, the naphtha is kept under official lock and key, and only allowed to be used for mixing under certain regulations; and the whole quantity, 100 gallons, "must be drawn off and used before any other naphtha is conveyed into the vat." "Naphtha disapproved by the board must be immediately removed from the naphtha warehouse."

The mixing must be done in the presence of officers of inland revenue, and "500 gallons of methylated spirits is the least quantity which may be prepared at one time in a mixing-room, whether the spirits used be British or foreign spirits." "The mixing must take place in a vat of sufficient capacity to admit of the spirits and naphtha being thoroughly mixed."

Methylated spirits is "supplied to such persons only as undertake to use it in the arts and manufactures, subject to the board's approval," and on entering into bond in the sum of from £200 to £1,000 penalty, depending on the annual consumption which they propose to employ. Scientific societies and hospitals who obtain the methylated spirits for scientific purposes are not required to give a bond.

All persons authorized to use methylated spirits are warned that they are not at liberty to purify the spirits in any manner whatever. "No person can legally use methylated spirits, or any derivative thereof, in the manufacture, composition, or preparation of any article whatever capable of being used either wholly or partially as a beverage, or internally as a medicine." It may be used, however, "in the preparation of sulphuric ether, chloroform, hydrate of chloral, soap, compound camphor, aconite, and belladonna liniments," without coming under the foregoing prohibition.

The premises of all users of methylated spirits are liable to inspection of the inland revenue officers at all times.

The following table gives the total quantity of methylated spirits produced in Great Britain since 1881, taken from the annual reports of the commissioners of her Majesty's inland revenue:—

Methylated Spirits.

1881.....	1,762,659 gallons.
1882.....	1,991,765 "
1883.....	2,100,765 "
1884.....	2,236,962 "
1885.....	2,334,835 "
1886.....	2,477,798 "
1887.....	2,673,375 "
1888.....	2,707,492 "

This table shows a steadily increasing consumption.

Canada.

In Canada, where a similar law to England was for many years in force, the government permitted methylated alcohol to be manufactured in bond for use in the arts, and to be withdrawn upon the payment of an excise-tax of fifteen cents per gallon. Twelve gallons of wood naphtha of not less than 60 per cent over proof were added to 100 gallons of grain alcohol. Subsequently the Inland Revenue Department ascertained that such spirits were being demethylated and rendered potable, thus causing a serious loss of revenue. The law was therefore repealed, and the Department of Inland Revenue undertook to supply the trade with a substitute, composed of 25 per cent of wood naphtha and 75 per cent grain alcohol, which is supplied only to varnish-makers and other persons engaged in the mechanical arts. The persons using this grade of methylated spirits give bonds, in the sum of \$2,000, that such spirits

shall be used solely for the purposes mentioned, and in the premises described in their application. An inferior grade, consisting of equal parts of wood naphtha and grain alcohol, is supplied the trade without any restrictions as to its use (see letter from Assistant Commissioner W. J. Gerald, of Oct. 25, 1888, published in the "Annual Report of the Commissioners of Internal Revenue, 1888," p. cxx.).

Germany.

The German spirit law, and the regulations issued to carry it into effect, permit of a sliding scale of adulteration, depending on the designated use of the "denaturised spirits."

For most purposes, a mixture of two parts of wood naphtha and one part pyridine bases to one hundred parts of alcohol is permitted. The wood naphtha is submitted to certain prescribed tests in regard to color, specific gravity, boiling-point, miscibility with water, contents of acetone, and capacity for absorbing bromine. The pyridine bases are likewise examined for color, behavior towards cadmium chloride, boiling-point, miscibility with water, contents of water, and volatility.

The regulations that have been issued from time to time have variously amended those preceding them. Those of June 21, 1888, are the latest, and several of the provisions contained therein did not come into force till the first of this year.

Makers of the general denaturising agent are permitted to add "40 grams of oil of lavender or 60 grams of oil of rosemary to every litre." Such addition has likewise to reach a prescribed standard.

"It is illegal to remove, or partially remove, the denaturation agent, or to add substances whereby the taste or smell of the denaturised spirits is altered." The selling or placing on sale of such purified spirits is likewise declared illegal.

Manufacturers may also use "five parts of wood naphtha instead of the general denaturation agent or pyridine bases" under certain regulations, and may sell the same "to persons engaged in industrial pursuits."

Varnish and polish makers may use "0.5 per cent of oil of turpentine" for this purpose, and may likewise sell varnishes and polishes so prepared to the trade. In "the manufacture of glazes for brewers' use the denaturation may be made with 20 per cent of a solution of one part of shellac in two parts of 95-per-cent alcohol. The alcohol used for such solution is to be free of tax."

In "the preparation of the alkaloids, medicinal extracts, chloroform, iodoform, chloral hydrate, sulphuric ether, acetic ether for technical purposes, collodion, tannin, salicylic acid and its salts, white lead and acetates, the alcohol may be denaturised by 0.5 per cent of oil of turpentine, or by 0.025 per cent of animal oil, or 10 per cent sulphuric ether."

"For making colored varnishes, 0.5 per cent of oil of turpentine, or 0.025 per cent of animal oil," is permitted; and for alcohol used in the "analysis of sugar-beets in sugar-factories, 0.025 per cent of animal oil" is the quantity prescribed for denaturation.

"For the preparation of acetic ether intended for technical purposes, freedom from tax can only be granted for the alcohol to be used under condition that besides the prescribed denaturation of the alcohol," as already mentioned, the ultimate destination of the acetic ether must be indicated, and will be controlled by suitable regulations.

The "animal oil, oil of turpentine, sulphuric ether, and shellac solutions intended to be used as denaturation agents, must satisfy the prescribed tests," and be submitted to an officially appointed chemist, and be approved by him before they are permitted to be used for the purpose. The expense of such test is borne by the manufacturer.

"For the preparation of vinegar, alcohol may be denaturised by 200 per cent of acetic acid of 3 per cent, or by 30 per cent of acetic acid (vinegar) of 6 per cent, or by 70 per cent water and 100 per cent beer." It is also allowable to use, "besides the prescribed quantity of acetic acid (vinegar), 100 per cent of pure genuine wine instead of the beer and water."

Alcohol of "less than 80 per cent" is not permitted to be treated, and "not less than 50 litres" must be treated at a time. The mixing must take place under the supervision of two revenue officers.

United States.

The bill now before Congress contemplates: 1. The use of large, bonded warehouses for the storing exclusively of spirits "of not less than 180 per cent proof." 2. The removal of such spirits free of tax from the bonded alcohol warehouses to bonded storerooms, to be "used in manufacturing establishments, in the industrial arts, and in the manufacture of articles, preparations, compounds, acetic and other acids, and medicinal drugs or chemicals." "The manufacture of tinctures, proprietary articles, wines, liquors, cordials, bitters, or other alcoholic compounds which are used or sold as beverages," is excluded from the provisions of the act. "The commissioner of internal revenue, with the approval of the secretary of the treasury," is to make and enforce all needful regulations. The bonds for the alcohol warehouses are not to be in a less sum "than \$100,000;" and those for storerooms to be not "less than \$5,000;" all operations conducted in such bonded establishments to be under the supervision of revenue officers, as is now customary in all distillery warehouses. 3. The proprietor of any bonded alcohol warehouse may methylate such spirits free of tax, so as to cause them "to be unfit for use as a beverage," under prescribed proportions and regulations; and such methylated spirits may be withdrawn from the warehouse upon a permit issued in due form by any person who has complied with the provisions of the law, and filed the necessary application and bond with the collector of internal revenue in whose district the methylated spirits are to be used; the sale, removal, transportation, and use of such methylated spirits to be under prescribed regulations and bonds. Heavy penalties are prescribed for the purification, by any means, or the use, of such purified methylated spirits.

It will be seen from this review of the legislation on the subject, that the purification of methylated spirits is made unlawful, from which one might conclude that this process does not render the spirits altogether unfit for drinking-purposes when properly purified.

Having been requested by the commissioner of internal revenue to make experiments for the purpose of ascertaining whether such spirits could be demethylated, the experiments were made, and my report on the subject was published in the "Annual Report of the Commissioner of Internal Revenue," lately issued.

I now beg leave to submit to the members of the society some of the samples of distillates and artificial liquors produced, and let them judge for themselves how far I have succeeded in making a drinkable compound.

Ten per cent of the methyl alcohol was used for adulteration as being the largest amount known to me, when the experiments were carried out, as being legally permitted. The provisions of the Canadian law I did not learn of till after my report was written. As soon as I have some leisure, I intend trying to purify 25 and 50 per cent of adulteration.

The loss was, for the reasons stated in my report, much greater than would happen on a commercial scale; and, as long as there is a high tax on distilled spirits, a large loss might take place in purifying methylated alcohol, and yet render the illegal process profitable enough for unscrupulous persons to take the risk of detection.

Since the bill has been introduced a strong opposition to its provisions has been developed in the large wholesale and retail drug trade, and the *Oil, Paint, and Drug Reporter* has lately been devoting a great deal of space to the views of the most prominent dealers. They are of the general opinion that alcohol should be free to all, or not at all; that the small druggist who now prepares a great many, if not most, of his medicines, etc., would be driven out of the business, as he could not afford the bonded storeroom, etc., and be compelled to purchase from a few large firms who could readily afford to comply with all the necessary regulations; and, lastly, that the supervision at all times of revenue officers over their business is distasteful to them. A great many of them state, that, even if the alcohol was methylated, it would most certainly have to be purified before they could make use of it.

The great supporters of the measure are of course the alcohol-producers, who see in its provisions an increased market for their product.

ELECTRICAL NEWS.

Dissipation of Fog by Electricity.

SOME remarks in the editorial columns of the *London Electrician* have called forth a letter from Professor Lodge on the subject of the dissipation of the London fogs by means of electric discharges. At the Montreal meeting of the British Association, in 1884, Professor Lodge described some experiments in which he condensed smoke by means of a brush discharge from points connected with a static electric machine. The subject was an interesting one, and attracted considerable attention at the time; but it seems that no experiments on a large scale have since been attempted. A number of possible applications have been suggested, — for example, it has been proposed to use an electric discharge to dissipate the dust-particles in flour and other mills, which have been the cause of several disastrous explosions, — but the efficacy of the plan has not been tried. In the letter referred to, Professor Lodge states that he has been deterred from experimenting chiefly on account of the great initial expense necessary for a trial on a large scale, — an expense which he estimates to be in the neighborhood of five thousand dollars. As to the form of experiment, he is not sure that a battery of an enormous number of cells would not be the most likely plan. So far, the largest experiment that Professor Lodge has made has been the clearing of a smoke-filled room; but the results were so encouraging, that he does not despair of condensing the fog in a stagnant atmosphere. He has applied to the trustees of the Elizabeth Thompson fund in this country for a grant of five hundred dollars with which to continue his work, but has not yet heard the result of his application. The matter is a most interesting one. We have an entirely new field for electrical application, with a very substantial promise of reward for success. There are a number of possible applications of the process, — the clearing of smoke from tunnels, the dissipation of dust-particles in mills, and the general abatement of the smoke nuisance that is so unpleasant in manufacturing towns.

TRIALS OF THE SUBMARINE BOATS "GYMNOTE" AND "PERAL." — At a recent meeting of the French Academy of Sciences, Admiral Paris read a short paper on "The Submarine Boat 'Gymnote,'" which we lately described. He was most enthusiastic as to its success, and in the course of his remarks said, "In short, we are able to say that the 'Gymnote' moves and steers equally well above or below the surface, that it can be kept accurately at the desired depth, that its speed is all one could expect, that respiration is unimpeded, and that down to a certain depth it is easy to see. M. Tédé says that Captain Krebs's electric motors are marvels of lightness and precision, and that this important part of the boat has been carried out in a most masterly manner. The energy available amounts to 240 horse-power hours. So complete a success would have been impossible without the scientific ingenuity and minute care which M. Romazoff, naval engineer of Toulon, brought to bear upon every detail. Here, then, we have a solution of the submarine-boat problem. The first step has been taken. Better work will be done in the future. But, even as it is, the 'Gymnote' is capable of rendering good service." From *Engineering* we take the following: "The new Spanish submarine torpedo-boat 'Peral,' which has lately been tested with much success, is 72 feet long by 9.5 feet in diameter. It is fitted with a secondary battery of 600 cells, which supply the current to five electro-motors, two of which are of 30 horse-power each, and drive the propellers; the other three are only of 5 horse-power each. The boat has a speed of 11 knots on the surface, and 10.5 knots below. It can remain submerged for two days before the air requires to be renewed. It will be armed with Whitehead torpedoes." With the recent partially successful experiments with directable balloons, and these latest experiments with submarine boats, we may expect novel developments in warfare.

NEW RECKENZAUN TRAM-CAR. — The principal novelties in this car consist in the method of gearing the motors to the car-axles, and in the employment of a form of secondary battery on which Mr. Reckenzaun has been working for some years past. The ordinary practice of connecting the motor-shafts and car-axles is through two pairs of spur-gears, the ratios of the diameters giv-

ing the necessary reduction in speed, — about one turn of the car-wheels to ten or twelve of the motor. A single pair of gears would be sufficient for light work, but for climbing hills a single reduction would make the strain on the teeth too great. The efficiency of spur-gears is very great, and, when properly constructed, there is very little noise or jar. A much more compact arrangement, though a less efficient one, has been adopted by Mr. Reckenzaun. He uses a simple worm gearing, where the motor-shaft and car-axle are at right angles to each other. Such an arrangement has been generally avoided because of the supposed great loss through friction. From his own experiments, however, Mr. Reckenzaun concludes that the losses are greatly overestimated, and by taking especial care in the lubrication he has obtained efficiencies that compare favorably with the efficiency of spur-gears. But it is in the storage-battery that the greatest interest of the system lies. It does not seem to be any great improvement over the present battery in weight — the cells on a car weigh about two tons — or in efficiency, but it is claimed that the durability will be greater than that of the ordinary type. The plates are made by forming by pressure cylinders of active material, a sixth of an inch in diameter, and about an inch and a quarter long, putting them in a mould and casting lead around them. The cylinders are only about a tenth of an inch apart, while the thickness of the lead in which they are embedded is one-eighth of an inch. The advantages of this form of plate lie in the fact that the active material is held firmly in its place, and that the greater part of the expansion is in the direction of the length of the cylinders: so the chance of buckling is less, while a large active surface is offered to the action of the acid. The total weight of the car, with thirty passengers, is about seven tons and a half, and about five electrical horse-power is required to draw it on a level at a velocity of seven to eight miles an hour. On a hill with a grade of five per cent, the motors absorb twenty electrical horse-power. The car described has been built by Messrs. Stephens, Smith, & Co., and is for use in Melbourne, Australia.

SNOW-STORMS ON ELECTRIC ROADS. — The winter has thus far been so mild that electric railroads have hardly had a fair test as to their capability of working under adverse circumstances. One snow-storm in St. Joseph failed to stop the electric line there; and now we have news of a blizzard at Davenport, Io., through which the Sprague cars ran without interruption. In this last case the snow — of the heavy, damp variety — covered the streets to a depth of four or five inches, with drifts in places across the tracks. While this is satisfactory enough, it must be remembered that it is not the wet, slushy snow that is most to be feared, but the dry variety, that cakes on the track and prevents contact being made between the wheel and rail. The only safeguard against trouble from this last cause is to keep cleaning-cars going as long as the snow-storm continues. There is another difficulty, especially when a heavy overhead wire is used, and this is from the formation of a coating of ice or sleet, preventing the trolley from touching the wire. While in the two cases cited there has been nothing but encouragement, yet there have been rumors of troubles that occurred at Washington, at Lynn, and perhaps at Brockton, on account of snow and ice. These were no doubt caused by insufficient experience, and from neglecting common precautions, and were only small matters at the most, but they at least show that precautions must be taken.

APPLICATION OF ELECTRIC MOTORS TO MINING. — At the Drane Colliery, near Osceola, Clearfield County, Penn., Mr. F. M. Lechner has devised a most interesting application of motors to mining-work. A ten-horse-power Sprague motor is mounted on a truck running on rails, so it can be easily moved from one place to another. The weight of the machine is something less than a thousand pounds. The cutter to be operated is set in position in the space to be cleared, and is connected to the motor by a $\frac{5}{8}$ -inch rope belt, movable pulleys on jack-screws being so adjusted that the cutter can be operated at any angle from the motor. The latter is about thirty feet from the cutter, the tension of the belt being adjusted by moving the truck one way or the other. The machine runs easily and cuts well. By this plan three cutters can be worked from one motor, two being adjusted while the third is at work, the motor being moved from one to the other as it is needed. It was

found, on a preliminary trial of this apparatus, that by its use two men could excavate one hundred tons in ten hours, and that they can move the cutter as often as desired without any auxiliary aid. The efficiency of the dynamo and motor are each over ninety per cent, and, allowing ten per cent loss on the line, between seventy and seventy-five per cent of the power delivered to the dynamo can be called on at the motor for work. It has been estimated that the cost of equipping a mine with electric power is only half of that of compressed air, while the working expenses are about in the same proportion.

SCIENTIFIC NEWS IN WASHINGTON.

Some Habits of the Omahas. — Electrical Conductivity of Glass. — Fish Commission Experiments. — The Woman's Anthropological Society. — The Survey for Irrigation. — Indian Relics from Florida.

Some Habits of the Omahas.

The following statements have just been made by an Omaha Indian (Samuel Fremont) to Rev. J. Owen Dorsey: —

The Omahas used to blow the smoke of the pipe in six directions, up, down, and to the four winds, using a prayer in each case. The exact order in which the winds were addressed has been forgotten; but the smoker could pray to the being above first, if he wished, and then to the being below, or *vice versa*. The earth itself was spoken to as if it was a person. The formula was as follows: "One of you lies on his back [i.e., the earth], the other one sits above: both of you help me!" Then followed the petition, "Oh, ye who cause the four winds to reach a place, help ye me!"

White people think that the Omahas knew nothing about Wakanda (a higher power, the Mysterious Power) before the meeting of the two races; but that is not so. They had many old sayings, used before they met the white people, such as, "Wakanda has decided for him his own (child, descendant, etc.)," "Wakanda knew," and "Wakanda seems to have aided him." These were employed when an Indian met with unexpected good luck. But the Pawnees had many more sayings about Wakanda than the Omahas had.

Before the advent of the white people, the Omahas used to get the wild honey, which they called "bee-dung." Its present name is "bee-gum." They put the comb in a kettle, in which they let it melt and boil, skimming off the impurities. They used the sirup as the white people do molasses. Unless the bees were troublesome, they did not smoke them when they took the comb.

Electrical Conductivity of Glass.

Dr. C. Barus has just completed a protracted investigation on the effect of stress (traction torsion) on the electrical conductivity of glass at different temperatures between 100° and 360°. The question is of unique importance, because the conductivity of glass is wholly electrolytic. He finds that stress of the kind given materially increases conductivity; whence it follows that the time-rate at which molecular reconstruction takes place in glass is definitely greater when this substance is longitudinally extended or twisted than when it is free from such strain. The result has a direct bearing on the viscosity of the solid.

Fish Commission Experiments.

Marshall McDonald, United States fish commissioner, is making a comprehensive experiment in salt and fresh water aquariums. He has already constructed several aquariums on the lower floor of the building, and stocked them; and he is now building a large one, 120 feet long, under a separate roof. The commissioner said to the correspondent of *Science*, "I am going to bring the seashore to Washington, and assemble here a full representation of our marine life." He has sixty or seventy species already sporting in salt and fresh water tanks, one of the latter containing specimens of the earliest type of fresh-water fish, — the ganoids.

The Woman's Anthropological Society.

One of the active scientific societies of Washington, and one whose work is of peculiar interest in that it is carried on solely by the sex sometimes supposed "incapable of generalizing," is the Woman's Anthropological Society. Despite the temporary retire-

ment of the president, Mrs. T. E. Stevenson, who is well known for her personal work among the Zuni, the society enters upon the fifth year of its existence with undiminished enthusiasm and vigor; Mrs. Sybil A. Carter (wife of the Hawaiian minister) and Miss Florence Spofford acting respectively as president and secretary. Two meetings were held during January. On the 5th the subject of discussion was "The Evolution of a Community (Amana)," as presented by Mrs. Anita Newcomb McGee. The author of the communication has been for several months engaged in investigating the communistic societies of the United States, nearly all of which she has visited. The more general results of her studies were laid before the American Association at Cleveland in August last. Some of the elements of success or failure in communistic organizations are obscure, and have seldom been perceived by writers on the subject; and these Mrs. McGee sought to develop and set forth by a study of the origin, growth, and relations to environment at every stage, of the most successful American community. The conclusions were in line with those stated at Cleveland, and summarized in the *American Naturalist* for September last. The meeting on the 19th was occupied in the presentation of a communication on "Russia and the Russians" by Mrs. Hunt, widow of the late minister to the Muscovite dominion. The habits, customs, and beliefs of the various classes of Russia were vividly portrayed; and the skill of artificers in certain Russian villages in the production of enamelled silver and other wares, etc.,—arts handed down from generation to generation in Oriental fashion, and unknown elsewhere,—was illustrated by the exhibition of a collection of silver and fictile ware and unique textile fabrics.

The Survey for Irrigation.

Professor Thompson announces to the correspondent of *Science* that topographic parties of the United States Geological Survey engaged on the irrigation survey in New Mexico have completed their field-work for this season, and disbanded at Santa Fé.

An area of 3,500 square miles in the drainage basins of the Jemez and Rio Grande has been surveyed with sufficient detail to construct a map on the scale of two miles to an inch and contour interval of fifty feet.

This work has been under the immediate charge of Mr. Arthur P. Davis, who returns with most of his force to Washington to prepare final maps. One party, however, under charge of Mr. R. H. Phillips, will continue work in the lower Rio Grande valley, near El Paso, Tex., during the entire winter. A number of eligible sites for reservoirs and diverting dams have been located. It is estimated that sufficient water can be stored in the mountains about the head waters of the Jemez River to irrigate 150,000 acres of land where now the waters only serve about 4,000 acres.

Indian Relics from Florida.

Dr. Thomas Featherstonhaugh, a grandson of the famous pioneer geologist, has just returned from a visit to Florida, and has brought back an interesting collection of aboriginal remains. He thoroughly examined a mound of damp sand on the shore of Lake Apopka, about the geographical centre of the State, and farther south than any previous researches of the kind. The mound was fifty feet in diameter and fourteen feet high, and was covered with a dense growth of palmetto and other trees. It was found to be full of fragmentary bones and pottery, so numerous that Dr. Featherstonhaugh estimates that there could have been no less than four hundred bodies deposited there. A few Venetian beads near the top indicated intrusive burials, but below four feet there were no evidences of any intercourse with whites. Four shapely hatchets were recovered, also a charm-stone, and numerous specimens of decorated pottery. The whole find was presented to Major Powell, and by him turned over to the Museum.

NOTES AND NEWS.

STANLEY's letter to Tippo-Tip, which was recently published in the daily papers, contains no new information besides that which was conveyed in the recent telegrams. Stanley had succeeded in reaching Emin, and had returned to the Kongo in order to look after his rear guard. He was anxious to see Tippo-Tip, and invited

him to meet him at some distance from the Kongo, where he encamped. He intended to return to Emin. It was stated before, that Stanley's letters were detained for some unexplained reason at Stanley Falls Station, while the latest telegram said that there were no other letters besides the one mentioned, addressed to Tippo-Tip. The full information sent from Zanzibar has again proved incorrect, as was expected. The report of the arrival of a letter from Stanley had evidently been telegraphed to Zanzibar by way of London, where it was amplified and falsified, and came back through Reuter's agency. No reports on events in the Equatorial Province or on the upper Kongo coming from this source can claim any serious attention.

— The original portrait of Washington (right side of the face) by Gilbert Stuart, long thought to have been destroyed by the artist, seems to have been recognized in the hands of Dr. W. F. Channing of California, who inherited it from his distinguished father, Rev. William Ellery Channing, who obtained it from his uncle, Col. Gibbs. It is understood that both New York City and Chicago have made offers for it, to hang in their art galleries, and its ultimate destination is doubtful.

— Surgeon-Gen. Hamilton has had one of his expert assistants, Surgeon Kinyoun, carry on a series of experiments as to the effectiveness of new disinfectants. Phosphorus was the one taken for the chemical tests, with litmus-paper and micro organisms: and the conclusions arrived at were, "1st, that phosphoric pentoxide is a disinfectant to surfaces only; 2d, it has no penetrating power, and is altogether unfit for fumigation of any thing where penetration of the agent is desirable." So perishes the hope that the fumes of phosphoric pentoxide would be useful in extirpating the bacteria of disease.

— On the evening of Jan. 23 the Mathematical Section of the Philosophical Society held its forty-ninth meeting, elected officers, and heard and considered these papers: "A Brief Control for General Solutions of Normal Equations," by A. S. Flint; "On Napier's Logarithms," by Artemas Martin; "General Perturbations of the Minor Planets," by W. F. McK. Ritter.

— A bill has been introduced in the Legislature of Nebraska to provide for a geological survey of the State with special reference to economic purposes. It proposes co-operation with the United States Geological Survey. The professor of geology in the State University at Lincoln is made *ex-officio* State geologist, and the sum of five thousand dollars for each of two years is to be appropriated for the work.

— The War Department has granted to the Smithsonian Institution the privilege of erecting an astro-physical observatory on the heights of Arlington; its purpose being, as its name implies, the investigation of the physical constituents of the heavenly bodies.

— The bill for the establishment of a zoological park and museum stands much better in Congress than it did at the last session, and it looks at this moment as if the appropriation for the purchase of the land on Rock Creek would be granted. Professor Hornaday has made a strong impression on the committees which he has addressed, and has excited national emulation by contrasting this country with other lands in its neglect of opportunities to study its own natural history.

— The scientific bureaus of Washington are seeking more elbow-room. The ambition of the Geological Survey to have a new building (\$600,000) is matched by that of the Smithsonian, which seeks an appropriation of \$500,000 for the erection of a building in the other corner of the grounds. The plan contemplates a structure somewhat like the present, but without an interior court, and with two stories and a basement instead of one story.

— The National Museum has secured Col. James Stevenson's private collection of Indian relics, entirely Pueblo. It contains several hundred pieces, among them an example of pottery for which Tiffany recently offered \$250.

— Experiments are being made at Wheeling, W. Va., with a view to the utilization of natural gas as a fuel in the smelting of iron ore.

SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

47 LAFAYETTE PLACE, NEW YORK.

[Entered at New York Post-Office as second-class mail-matter.]

SUBSCRIPTIONS.—United States and Canada.....\$3.50 a year.
Great Britain and Europe..... 4.50 a year.

Science Club-rates for the United States and Canada (in one remittance):

1 subscription 1 year	\$ 3.50
2 " 1 year.....	6.00
3 " 1 year.....	8.00
4 " 1 year.....	10.00

Communications will be welcomed from any quarter. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

VOL. XIII.

NEW YORK, JAN. 25, 1889.

No. 312.

CONTENTS:

THE STORAGE OF ELECTRICITY.....	53	NOTES AND NEWS.....	61
A BLIZZARD MEETS AN ELECTRIC ROAD.....	56	EDITORIAL.....	62
TESTING A PNEUMATIC DYNAMITE GUN.....	56	Political Influence in New York Schools.....	
THE RISLEY AND LAKE COMPOSING-MACHINE.....	56	THE VALUE OF MERCURIC CHLORIDE AS A DISINFECTANT.....	62
METHYLATED ALCOHOL Edgar Richards	57	FIFTH ANNUAL REPORT OF THE BUREAU OF ETHNOLOGY.....	64
ELECTRICAL NEWS.		BOOK-REVIEWS.	
Dissipation of Fog by Electricity..	59	The Birds of the West Indies....	65
Trials of the Submarine Boats "Gymnote" and "Peral".....	59	Louis Lambert.....	65
New Reckenzaun Tram-Car.....	59	AMONG THE PUBLISHERS.....	65
Snow-Storms on Electric Roads...	60	LETTERS TO THE EDITOR.	
Application of Electric Motors to Mining.....	60	Dew-Point and Predictions of Weather H. A. Hazen	70
SCIENTIFIC NEWS IN WASHINGTON.		Horns of the Prong-Buck (Antilocapra) Henry L. Ward	70
Some Habits of the Omahas.....	60	Felspar, or Feldspar? A. R. C. Selwyn	71
Electrical Conductivity of Glass...	60	The Soaring of Birds Wm. Kent	71
Fish Commission Experiments....	60	The Color of Katydid Jos. Story Fay	71
The Woman's Anthropological Society.....	60		
The Survey for Irrigation.....	61		
Indian Relics from Florida.....	61		

WE CALLED ATTENTION last week to the condition of affairs in the New York City Board of Education, and chronicled the triumph of political chicanery over public interest in the organization of the board for the coming year. Inasmuch as this situation in New York is of the greatest importance to educational interests all over the land, we shall revert to it from time to time, and endeavor to aid in forming an intelligent and conscientious public opinion which shall eventually displace the politicians and the politics that are now controlling the schools of the metropolitan city. The next contest will be over the report of the special committee on reform in the schools, the first instalment of which is now before the board, for action at its next meeting. The report is signed by Commissioners Webb, Cole, Sprague, O'Brien, Agnew, Dodge, Galloway, and Schmitt. It limits its consideration to a single point, and that perhaps the fundamental abuse of the New York City system; namely, the examinations of the children, as made by the city superintendent and his assistants, for the purpose of marking and grading the teachers and principals in the respective classes and schools. The committee believe—and we cordially indorse that belief—that many of the existing evils in the schools are the outgrowth and natural sequence of the methods now employed in a vain attempt to ascertain the true character of classroom work. The vicious system which is now in vogue has not (happily) the

sanction of any statute; but it has been built up by the present city superintendent and his predecessors, on the meagre provisions of a single by-law of the Board of Education itself.

This is the committee's account of the system: "The city superintendent or his assistants examine, orally and in writing, the children of every class in every school at least once a year. When the examination is to be made, a notice, varying in time from one to six days, is sent to the principal and teachers. The *average* time that the examiners spend with each class does not exceed half an hour. The main object of the examination of the pupils is to grade and mark the teachers, and to determine with what degree of success the classroom work is carried on. Marks are given by the examiners to the teachers on each subject; but the teachers are not informed what marks are awarded, nor is any provision made by which such information may be conveyed to them. The general results are reported to the trustees of the respective wards in which the teachers are employed; but as to how such results are reached, or in what particular subject a class may have failed, the record is silent. The teachers know that these marks (if they receive any attention) will form the basis upon which promotion, or worthiness for promotion, is to be determined. They know that in case of illness, when it may be necessary to come before the board, if the marks are below a certain standard, the salary expected may be seriously diminished; and that, in case two marks of 'fair' are awarded in succession, a summons will be received to appear before a committee of the board and answer to a charge of inefficiency as a teacher. At times, to the young, nervous, or inefficient teacher, the examination is a positive bugbear, and the examiner a natural enemy; and this estimate is speedily detected and shared in by the pupils. In such a class the examiner is not looked to for help, suggestion, or instruction; but he is regarded as one from whom all faults and weaknesses must be diligently concealed, and before whom the children are to make as brilliant a show as possible. His sole purpose is to assign a mark for each study, and that mark is to go down on the official record, to aid or mar the teacher's future advancement in the system."

This is the barbarous practice by which the executive officers control the schools and intimidate the teachers. Its mere statement is sufficient indictment. What are you going to do about it? say its beneficiaries. The committee is ready with an answer. After adequate examination, divide the teachers once and for all into two grades,—maximum and standard. All teachers who have been at least five years in the system, and who satisfy the principals with whom they have served, and the city superintendent (or, if they fail to agree, the committee of the Board of Education on teachers), are to be classed as maximum grade, and relieved of future examinations by the superintendent or his assistants, unless the principal reports that such a teacher is falling off and should be subjected to inspection. All other teachers shall be classed as standard grade, and shall receive not only visits of inspection, but help, from the assistant superintendents, in order to aid them in improving their work and in passing to the higher classification. The committee elaborates this principle, and reports the necessary amendments to the by-laws of the board, to place it in operation. The recommendations should be adopted, although it is reported that the "ring" will oppose them bitterly. We shall await the vote with interest.

THE VALUE OF MERCURIC CHLORIDE AS A DISINFECTANT.

IN *Science*, xii. p. 185, we quoted at considerable length from an article by Dr. W. B. Hills of Cambridge, Mass., which first appeared in the *Boston Medical and Surgical Journal*, in which the author of the article criticised in severe terms the recommendations of the committee on disinfectants, of the American Public Health Association, with reference to the use of mercuric chloride as a

disinfectant. In commenting on this article of Dr. Hills's, we said that Dr. Hills's criticisms dealt, not with generalities, but with particular errors which he claimed the committee had made, and that his criticisms put the committee on its defence.

In an exceedingly able article published in the *Boston Medical and Surgical Journal* of Jan. 3, 1889, Professor V. C. Vaughan, of the University of Michigan, and a member of the committee on disinfectants, meets the criticisms of Dr. Hills completely, and places the report of the committee on more substantial ground than ever. This reply of Professor Vaughan's we have deemed of sufficient value to give in full.

The report of the committee of the American Public Health Association on disinfectants, together with the experimental investigation of others, has given great prominence to the employment of mercuric chloride as a germicide. Recently (*Boston Medical and Surgical Journal*, Aug. 25, 1888) Dr. William B. Hills of Cambridge, Mass., has criticised the above-mentioned report so far as it recommends mercuric chloride. As this is a matter of great practical importance, I propose in this paper to notice the points raised in this criticism. Dr. Hills does not seem to have made any biological or chemical tests himself, but founds his opinion upon what he deems to be well-established facts. The critic uses severe language with reference to the committee, and asserts that "it is not creditable" that the committee should have made the recommendations referred to upon the experimental evidence presented.

In the first place, Dr. Hills states that corrosive sublimate is rendered insoluble when brought in contact with organic matter. He says: "It is, however, a well-known chemical fact that the corrosive sublimate is destroyed, or at least undergoes chemical changes, when brought into contact with organic matter. It is immediately converted by albumen to the insoluble albuminate of mercury. For this reason, albumen is recognized as the most efficient antidote in cases of poisoning by corrosive sublimate."

Now, let us inquire into the well-known chemical fact referred to by Dr. Hills. I endeavored to show in the report, which Dr. Hills criticises, that the albuminate of mercury is soluble in solutions containing organic matter, and that it does diffuse through such solutions; but, as Dr. Hills places his opinion against my experience, we will see what others say upon this point. Merck (*Merck's Bulletin*, August, 1888) of Darmstadt says that the albuminate of mercury, which he manufactures according to the formula of Schneider (*Pharm. Centralblatt*, 1888), is readily soluble in blood-serum, meat-broth, sodium chloride, etc. Every physician knows that the albuminate of mercury is used hypodermically on account of its ready solubility and non-irritating properties. For the preparation of this compound either egg-albumen, blood-serum, or peptone is used. Merck uses egg-albumen, while Filehne (CLOETTA'S *Lehrbuch der Arzneimittellehre*, 1887, S. 134) recommends the following formula: "15 grams of dry peptones, 10 grams of bichloride of mercury, 15 grams of ammonia chloride, and enough water and glycerine so that each cubic centimetre of the solution shall contain from two to four milligrams of mercuric chloride." Other formulæ are given by other authors. In one place Dr. Hills admits that the albuminate of mercury is "slightly soluble," but he says "the amount redissolved is very small." Filehne's solution contains more than two and a half drams of the bichloride. This amount would hardly be called "very small." When Dr. Hills says that albumen is recognized as the most efficient antidote in cases of poisoning by corrosive sublimate on account of the insolubility of the albuminate of mercury, he teaches a doctrine which, I must admit, is wholly new to me. Mercuric bichloride owes its corrosive properties to the avidity with which it combines with proteids. In cases of poisoning by this salt, we give the albumen in order to supply a proteid with which the poison can combine without injury to the walls of the stomach, and then we hasten to give an emetic. What would be the result if we should leave the albuminate of mercury in the stomach? If this compound is so insoluble, why do we give the emetic? The idea that the albuminate of mercury would not be readily absorbed by the stomach, is, to use some of Dr. Hills's vigorous English, "so absurd that it would not deserve serious notice were it not for the fact" that it has been suggested by one so eminent in the profession. If mercury forms an inert compound with albumen and other proteids, how is it that

we get constitutional effects by the administration of the compounds of this base in the treatment of disease? Are the contents of the stomach and intestines always free from proteids when the medicine is administered? The truth is, that the albuminate of mercury is insoluble in water, but is freely soluble in excess of albumen, in blood-serum, in meat-broth, in solution containing sodium chloride, etc. Indeed, all the mercury given medicinally is said by leading therapeutists and physiological chemists to be converted into the albuminate before it is absorbed. Filehne says concerning the absorption of mercury: "The salts of mercury soluble in water form first with albumen compounds, which, partly in excess of albumen, partly from the action of other substances, as sodium chloride, hydrochloric acid, etc., are soluble, so that the passage of these compounds into the blood as soluble albuminates is undoubted. The compounds insoluble in water are, by the action of sodium chloride and hydrochloric acid, converted into the sublimate, and this in turn into the albuminate." Nothnagel and Rossbach (*Handbuch der Arzneimittellehre*, sechste Auflage, S. 194) say that while the albuminate of mercury is insoluble in water, it is freely soluble in excess of albumen and in sodium chloride.

Dr. Hills again says: "Sternberg, in the *Medical Record* for Aug. 1, 1885, affirms positively that the albuminate (of mercury) is a potent germicide, but gives no facts in support of this statement. Klein's experiments, however, suggest that its germicide power is very slight at the most. Admitting, however, that it has such power, the amount redissolved is very small, and this is likely to be converted at once to the inert sulphide by the sulphuretted hydrogen present."

I have italicized the assertion to which I desire to give immediate attention. Here Dr. Hills is again wrong. Sulphuretted hydrogen does not decompose the albuminate of mercury. Every toxicologist knows this, and destroys the organic matter before he attempts to precipitate mercury from solutions containing proteids. In the report of the committee, where I show that the albuminate of mercury is soluble, I state that the organic matter was destroyed by potassium chlorate and hydrochloric acid, after which the mercury was precipitated with sulphuretted hydrogen. Nothnagel and Rossbach (*loco citato*) say that "from the albuminate of mercury one cannot precipitate the metal with sulphuretted hydrogen until the organic matter has been destroyed." If sulphuretted hydrogen precipitate mercury from proteid solutions, the mercury so precipitated is not combined with albumen, and the occurrence of such a precipitation shows that the mercury exists in excess above that taken up in the formation of the albuminate. The albuminate of mercury is not easily decomposed.

Again: Dr. Hills thinks that the alkalies formed in decomposing matter would precipitate the mercury. Nothnagel and Rossbach (*loco citato*) say that "if common salt be added to an alkaline solution of albumen, mercuric chloride will then fail to produce any precipitate." No one will question the existence of common salt in privy-vaults.

It is true that Klein's experiments suggest that the germicide power of mercuric albuminate is very slight at most. Indeed, Klein asserts (or rather did assert) that a one-per-cent solution of mercuric chloride is no more a germicide than is vinegar. Certainly no one will now champion this statement, although vinegar is not worthless as a germicide. Koch found that the spores of the anthrax bacillus will not germinate in a proteid solution if there be present one part of corrosive sublimate in three hundred thousand. And yet Dr. Hills, without having made an experiment, condemns the committee for recommending a solution of corrosive sublimate, one to five hundred, for the disinfection of the liquid discharges of cholera, typhoid-fever, etc.

Dr. Hills finds very strong language of condemnation for the report of the committee in recommending that the amount of bichloride found necessary to sterilize broken-down beef-tea be multiplied by two, and used for the disinfection of the liquid discharges from the bowels of patients with cholera, typhoid-fever, advanced tuberculosis, septic diarrhoea, etc. As he bases his condemnation upon the incompatibility (?) of mercuric chloride with albumen, he must suppose that these stools contain a large amount of soluble proteids. In this he is again wrong: such discharges do not contain large amounts of albumen or other soluble proteids,

Simon (BECQUEREL and RODIER'S *Pathological Chemistry*, p. 459) obtained the following results from the analysis of the faecal matters in cholera :—

Water	980.00
Solid matters.....	20.00
Fat.....	0.08
Extractive matter.....	4.80
Albumen and mucus.....	0.52
Chloride of sodium, lactate and acetate of sodium, and alkaline phosphates.....	13.40
Phosphate of lime and magnesia	0.60

The blood contains, according to Hammerston, from 2.677 per cent (horse) to 4.436 per cent (rabbit) of serum albumen; and yet, according to Von Ermengen, mercuric chloride in solution of 1 : 800 and 1 : 1,000 sterilizes blood. With these figures before us, can we say that "it is not creditable to a committee of the leading sanitary association of this country" to recommend a solution of mercuric chloride 1 : 500 for the disinfection of cholera stools?

Practically we know that mercuric chloride does efficiently disinfect substances containing a hundred times as much proteid as cholera stools contain. This is done many times every day in bacteriological laboratories. Gelatine plates and tubes, agar tubes, and blood-serum tubes, laden with all the known germs, are disinfected with a solution of mercuric chloride 1 : 1,000. In Koch's laboratory this is the only disinfectant used, and there has been no evidence of its failure. Plates covered with colonies of the anthrax bacillus, the comma bacillus, etc., are immersed in the solution with the certainty that the sterilization will be complete. Old tube cultures are treated in the same way, and with the same result, whether they contain gelatine, agar, or blood-serum. Now, in the gelatine, one litre of beef-tea contains 100 grams of gelatine, 10 grams of peptone, and 5 grams of sodium chloride. We have seen that the albuminate of mercury is made with peptone as well as with albumen, and there is nearly twenty times as much peptone in this mixture as there is albumen in cholera stools, and nearly two hundred times as much gelatine besides. Certainly no one will question the large amount of albumen in blood-serum. Is it not strange, if the albuminate of mercury is so "inert," that the disinfection of these cultures should be so successful? Even the evacuations of infants with green diarrhoea, containing a large amount of undigested food, do not contain as much proteids as do gelatine cultures, as is shown by the following analysis of Golding Bird :—

Water.....	900.00
Biliverdin, alcoholic extracts, fat, cholesterine	24.50
Ptyalin, watery extract, colored with biliverdin	11.25
Mucus, coagulated albumen, and hematin	56.00
Chloride of sodium, with traces of tribasic phosphate of soda.....	5.50
Tribasic phosphate of soda	1.75
Peroxide of iron.....	1.00

In the first report of the committee (1885) a solution of chloride of lime was given the first place for the disinfection of excreta in the sick-room, and a solution of mercuric chloride of the strength of 1 : 500 the second place. In the latest report (1888) carbolic acid has been given the second place, and mercuric chloride has not been recommended for this purpose. This change was made because the carbolic acid was believed to be sufficient, and not because the mercuric chloride was believed to be inefficient. In the light of the most recent experiments in this country and abroad, we believe that mercuric chloride, in the proportion named, would be effective in the disinfection of the liquid discharges of patients suffering from typhoid-fever or cholera, and that the recommendation made in our first report was justified by the experimental data then given, and not yet contradicted by any new evidence.

The committee called attention to the action of mercuric chloride on lead pipes in its first report, and this influenced it in substituting carbolic acid for mercuric chloride for disinfecting the excreta in the sick-room.

To return to our critic, the broad statement is made, that "an examination of the report of this committee fails, however, to bring to light the slightest particle of evidence upon which such a recommendation could have been based;" viz., the disinfection of excreta with mercuric chloride. Dr. Sternberg, chairman of the committee, made extended researches upon the germicide power of this agent several years before (1883) the committee was appointed, and to those experiments reference is made in the first report. It is for

this reason that extended experimental researches were not made with this agent in 1885. However, a number of experiments were made, and recorded in our report. These show that even the solid or semi-fluid faeces of a healthy person may be sterilized by the use of the solution recommended by the committee, provided that they are broken up so as to be fairly exposed to the action of the disinfecting agent. Moreover, the fact is recorded that a certain amount of the mercurial salt remained in solution at the end of twenty-four hours, as shown by a deposit of mercury on a copper wire (experiment of Sept. 8). Yet our critic, without recording a single experimental observation of his own, states that there is not the slightest particle of evidence upon which our recommendation could have been based.

One who has given no special attention to chemistry may be pardoned for not being acquainted with the chemical nature of the albuminate of mercury, but certainly any one who had read our report could not have made the sweeping assertion which we find in Dr. Hills's criticism.

FIFTH ANNUAL REPORT OF THE BUREAU OF ETHNOLOGY.

THE "Report of the Director of the Bureau of Ethnology for the Year 1883-84" has just been issued, bearing the date 1887. The long delay of this report, which is caused by the pressure of work in the Government Printing-Office, must be greatly regretted, as the interest of science demands that scientific publications of the character of those accompanying the report be known as early as possible. The knowledge that certain statements and opinions are about to be published always acts as a drawback upon the progress of the special field of science, as most workers will delay further investigations until these publications are issued. While a few branches of science may not be very adversely affected by these delays, such is not the case in the science of anthropology, in which the most energetic and unceasing field-work is absolutely necessary, as the relics of ancient times, as the natives and their customs, are vanishing with steadily increasing rapidity. Publications of such importance as the one under discussion always prove an incentive to increased activity. The opinions and suggestions expressed in the papers accompanying the report do not fail to influence the progress of investigations. For all these reasons a more rapid publication of the annual reports is very desirable.

Major Powell, in the first part of the report, gives a brief review of the work carried on by the bureau. The scope of the researches is constantly increasing. In the year 1883-84 the mound-explorations were continued. Messrs. Stevenson and Mindeff carried on archæological researches in the South-west, while Mr. Frank Cushing devoted himself to further studies on the Zuñi. Linguistic work was done among the Iroquois, in California, and among the Navajo. While the final results of the works of the bureau will be published as "Contributions to the Ethnology of the North American Indians," the papers accompanying the reports generally treat certain phenomena of Indian life or art in the form of monographs or reports on peoples on which no material for exhaustive reports is obtainable.

Of the latter class, we notice in the present volume Rev. Clay MacCauley's description of the Seminole Indians of Florida,—an interesting sketch of the life and state of this small tribe living in the most inaccessible portion of the southern half of the peninsula.

The elaborate paper on "The Cherokee Nation of Indians: A Narrative of their Official Relations with the Colonial and Federal Governments," by Charles C. Royce, is an historical document of the greatest importance, the history of this great confederacy in its conflicts with the white settlers encroaching upon their territory being traced fully and exhaustively. The paper is an illustration of a work of wide scope undertaken by the bureau,—an historical atlas of Indian affairs, showing, upon a series of State and territorial maps, the boundaries of the various tracts of country which have from time to time been acquired through the medium of treaty stipulations or act of Congress from the several Indian tribes resident within the present territory of the United States. Accompanying the atlas will be one or more volumes of historical text, wherein will be given with some detail a history of the official

relations between the United States and these tribes. This will treat of the various negotiations for peace and for the acquisition of territory, the causes rendering such negotiations necessary, and the methods observed by the government through its authorized agents in this diplomacy, as well as other matters of public concern growing out of the same. The eminent value of this work to the historian is self-evident, and the laborious care bestowed by Mr. Royce upon the carrying-out of this plan promises that it will be at once an exhaustive and clear treatment of this important part of the history of our Republic.

The first paper of the volume is Professor Cyrus Thomas's treatise on "Burial-Mounds of the Northern Section of the United States." Since this paper was written, much evidence has accumulated which has been outlined in a bulletin of the Bureau of Ethnology. It corroborates the views expressed by Professor Thomas in the present report.

His conclusions, as set forth in this paper, are that different sections of the country were occupied by different mound-building tribes, which, though belonging to much the same stage in the scale of culture, differed in most instances in habits and customs to a sufficient extent to mark, by their modes of burial, construction of their mounds, and their works of art, the boundaries of the respective areas occupied. He furthermore concludes that each tribe adopted several different modes of burial, depending, in all probability, to some extent upon the social condition, position, and occupation of the deceased. The custom of removing the flesh before the final burial apparently prevailed very extensively among the mound-builders of the northern sections; the bones of the common people being often gathered together, and cast in promiscuous heaps, over which mounds were built. Usually some kind of religious ceremony was performed at the burial, in which fire played a prominent part; but, notwithstanding the very common belief, there is no evidence whatever that human sacrifice was practised. The builders of the mounds had not reached a higher culture than that attained by some of the Indian tribes found occupying the country at the time of the first arrival of Europeans. Professor Thomas concludes his treatise by expressing his opinion that the mound-building age cannot have lasted longer than about a thousand years, and that it continued to be practised in several localities in post-Columbian times.

There remain two papers to be noted, both of peculiar interest, — the one by Dr. Washington Matthews, who gives a very detailed description of one of the remarkable religious ceremonies of the Navajo; the other by Mrs. T. E. Stevenson on the religious child-life of the Zuñi.

Dr. Matthews describes the long ceremonies of the Mountain-Chant, and gives the long myth which is the foundation of these ceremonies. His paper concludes with the original texts of the songs, and translations of the same. It is impossible to give an account of the interesting contents of this essay, which is full of new facts of the greatest importance to the student of anthropology.

Mrs. Stevenson's paper is of a somewhat similar character, treating of the connection between certain customs and myths. This field of study, so ably taken up by Dr. Matthews and Mrs. Stevenson, has so far received comparatively little attention; and yet it is one of the most important for the study of the human mind and of the growth of institutions.

The publications of the Bureau of Ethnology mark every one a long step forward in our knowledge of man in America, and are therefore anxiously awaited by all students. We hope that the following volumes may be issued at shorter intervals, that the important material contained in them may soon become public property.

BOOK-REVIEWS.

The Birds of the West Indies. By CHARLES B. CORY. Boston, Estes & Lauriat. 8°.

IN preparing the present work, Mr. Cory examined a large series of birds from nearly all the islands of the West Indies, the combined collections representing many thousands of specimens. He made five trips to different parts of these islands, besides which a

number of collectors were sent out, for the purpose of obtaining as complete a series as possible. Several of these collectors were engaged upon their task from six to eighteen months, and it is fair to assume that their collections contained nearly all of the resident species of the islands which they visited. Some of these collections proved especially interesting, being very rich in novelties, the collections of one person containing no less than seventeen species new to science.

Most of the matter contained in the present work appeared originally in the *Auk* during the years 1886, 1887, and 1888; but since that time a large number of species have been added to the West Indian avifauna which were either new to science or had not been previously recorded from that locality. Descriptions of these are given in an appendix, unless included in their proper order in the body of the work. A number of alterations and corrections have been made in the original plates, and several new illustrations have been added. No descriptions are given of well-known North American birds, and the references to such are mainly restricted to the citation of works and papers on West Indian ornithology.

The excellent mechanical make-up of the book admirably supplements the painstaking and thorough work done by Mr. Cory in its preparation.

Louis Lambert. By HONORÉ DE BALZAC. Tr. by Katherine P. Wormeley, with introduction by George F. Parsons. Boston, Roberts Bros. 12°. \$1.50.

BALZAC seems to have written this story for the express purpose of making known what he would call his philosophy, which is a curious compound of mysticism and nonsense. The hero of the tale, Lambert, is introduced when a boy, and considerable space is given to his experience and reflections while at school. At a later time, after a season in Paris, he falls in love with a titled lady, and marries her. Unfortunately, however, he becomes insane just before his marriage, and remains so ever after, and dies while still a young man. The "philosophy" of the book is contained partly in his conversations and letters, but chiefly in some papers composed after he became insane; and these latter seem to be the dearest to the soul of Balzac. The doctrine expressed in them is of the occult kind, as will be seen from the following specimens: "Here below all is the product of an ethereal substance, the common base of several phenomena. . . . Will is a fluid, the attribute of every being endowed with motion. . . . Facts are nought; they do not exist; ideas alone exist. . . . All things here below exist only by motion and by number. . . . There is a number which impurity cannot transcend — the number wherein creation is finished. . . . Three and seven are the two great spiritual numbers" (pp. 138-148). Besides the story that gives name to the book, there are two others in the volume; but there is little connection between them and Louis Lambert; and the second of them, Gambara, we have found intensely disagreeable. The introduction to the book, which is as long as the leading story, is partly a summary of Balzac's ideas, and partly an attempt to reconcile them with the teachings of physical science, — an attempt which, as may be supposed, is not very successful.

AMONG THE PUBLISHERS.

GINN & Co. announce "An Introduction to the Poetry of Robert Browning," by William John Alexander, Munro professor of English language and literature, Dalhousie College and University, Halifax, N. S., and formerly fellow of Johns Hopkins University, to be published in February. The book opens with an account of Browning's most striking peculiarities in method and style, and attempts to find an explanation of these in the conditions amidst which the poet has worked, and in the nature of the themes which he treats. In the next place, an exposition is given of those general ideas pervading his work, which can only be gathered from the study of many of his poems, and yet are needful for the full understanding of almost any one of them. This exposition is contained in a series of chapters on "Browning's Philosophy," "Christianity as presented in Browning's Works," and "Browning's Theory of Art." These chapters are followed by a brief chronological review of his writings, and characterization of his development. The various points treated throughout the introduction are illustrated

by a series of selected poems furnished with careful analyses and copious critical comments. It is hoped that by thus unfolding, in a few typical examples, the characteristics and merits of Browning, the reader may at once be enabled to acquire a real knowledge of his poetry, and be prepared for further unassisted study of his work. The attention of those already familiar with Browning is especially directed to the analysis of "Sordello," much fuller and more exact, it is believed, than any heretofore published.

—The *Revue Philosophique de la France et de l'étranger*, edited by Th. Ribot, professor at the Collège de France, has just commenced its fourteenth year. This periodical is published monthly, each number containing about one hundred pages. Special attention is paid to psychology and its indispensable auxiliaries, anatomy and physiology of the nervous system, pathology of the mind, anthropology, and inductive and deductive logic. Reports on the current philosophic literature enhance the value of the journal.

—The *Revue Historique* for 1889 continues to be of great interest. It is published bi-monthly, and, besides original contributions, each number contains notes of general interest, unpublished documents, and a useful bibliography. It is published by F. Alcan, Paris.

—Neumayr, the distinguished paleontologist of Vienna, has just published through Tempsky a first stout imperial octavo volume of a work upon which he has been engaged for many years, in which he is to review the entire series of extinct animals in the light of the derivative theory of organic life. Under the title "Die Stämme des Thierreiches" he discusses the lower forms of life, leaving the mollusks, arthropods, and vertebrates for future volumes. The purely theoretical side of the subject and the purpose, with which he began his studies, to search in every quarter for proofs of the alteration of forms, have gradually, in working out his scheme, given place to a critical and scholarly investigation into the general morphology of fossil animals; and his work will thus prove of the utmost value not to the paleontologist only, but equally to the zoölogist. No living naturalist is more competent than he to perform the task. In an introduction of over 150 pages he discusses the general questions of the relations of the derivative theory to paleontology in a masterly manner; subsequent chapters take up successively the protozoa, coelenterates, echinoderms, worms, and molluscoids. The second volume, treating presumably of the remaining invertebrates, is, he tells us, nearly completed. The work forms an excellent complement to Zittel's nearly completed "Handbook of Paleontology."

—The *American Naturalist* for January (New York, Leonard Scott Publishing Company) will contain an article on "Primitive Architecture," by Mr. Barr Ferree, in which is traced the various sociological causes that have influenced the form and construction of the dwellings of primitive peoples. The same number will contain an article on "The Food of the Owls," by Dr. W. S. Strode; on "The Ancient Glaciers of North Wales," by Professor Evans; and on "Lichens," by Professor Williams. The departments of the magazine will present their usual summary of the progress of all branches of natural science within the past month.

—A remarkably successful attempt at photographing the very shy Big-horn, or Rocky Mountain sheep, will be described in the February *Scribner* by Frederick H. Chapin, who succeeded in taking a group on Table Mountain, Colorado, in 1887. The photograph has been engraved to accompany the article. In the same number Austin Dobson will recall some memories of "Old Vauxhall Gardens" in its prime,—the days of Walpole, Fanny Burney's "Evelina," and Fielding's "Amelia." The article will be fully illustrated from old prints. In his article on Sir Walter Scott, Ex-President Andrew D. White of Cornell will say of him, "Never was there a more healthful and health-ministering literature than that which he gave to the world. To go back to it from Flaubert and Daudet and Tolstoi is like listening to the song of the lark after the shrieking passion of the midnight pianoforte; nay, it is like coming out of the glare and heat and reeking vapor of a palace ball into a grove in the first light and music and breezes of the morning." George Hitchcock, the artist whose contribution to

Scribner's Christmas number on "Botticelli" will be recalled, will appear in the February number, with a second article on "The Picturesque Quality of Holland," this time describing "Interiors and Bric-a-brac." Mr. Hitchcock has for many years lived in Holland. The February instalment of Robert Louis Stevenson's romantic novel, "The Master of Ballantrae," will describe the pathetic persecutions of "Mr. Henry," and the unexpected return of the "Master." Brander Matthews will have in the number an ingenious and fanciful story, entitled "A Family Tree."

—Charles A. Wenborne, Buffalo, N.Y., announces for immediate publication an "authorized" American edition of Laurence Oliphant's "Scientific Religion; or, Higher Possibilities of Life and Practice." This book, when first published in London eight months ago, immediately became a subject of such wide-spread interest that the author felt impelled to arrange, also, so says Mr. Wenborne, "for its publication in the United States. He visited this country last summer, and upon his return to England was taken down with the fatal illness that terminated his eventful life on Dec. 23. The author's intention to give a distinct introduction to the American edition was carried out by his newly wedded wife, an American lady, born Dale Owen, who had for some time been a distinguished co-worker in that field of religio-philosophical science of which Laurence Oliphant may be regarded as the most brilliant, most profound, and most advanced explorer of modern times."

—*The Green Bag*, "a useless but mildly entertaining magazine for lawyers," to be edited by Horace W. Fuller, is announced by Charles C. Soule, Boston. It is to be a monthly, intended to interest and entertain lawyers. It will cover legal history, antiquities, biography, news, gossip, and facetiae, together with correspondence and book notices. The first number, to be published this month, will contain an excellent portrait of Chief Justice Fuller in his robes of office. Each subsequent number will contain the portrait of some distinguished judge or lawyer. There will also be illustrated articles, among them a series of papers upon the leading American law schools.

—We have received two pamphlets by Charles H. Fitch of Denver, Col., on "Womanhood Suffrage" and on "The Fallacy of Free Land" (published by the author), but we find nothing new or valuable in either of them. The first presents the usual arguments in favor of woman suffrage, but in an obscure and rather grandiloquent style. The second is an argument for the Henry George theory of rent, and the injustice of private property in land, but contains nothing that has not been repeatedly said by others. The subjects treated, like some other political and economic questions of the present time, have been discussed so much, that unless one can say something new on them, or can present the old arguments in a superior form, there seems to be no good reason for his treating them at all.

—One of the best known of the English journalists in America to-day is Mr. W. T. Stead, the managing editor of the *Pall Mall Gazette*. As a journalistic worker, Mr. Stead has seldom had an equal; and recently, when offered a vacation, he took it on the condition that he might work. The vacation became a trip to Russia, the result of which is to be published in a stout volume by Cassell & Co. While the political situation is the burning question of the book, he has time to visit Count Tolstoi, and to give the reader pictures of Russian life painted with a realism that M. Verestchagin might envy.

—The *American Anthropologist* for the first quarter of 1889 comes to us in a handsome brown cover and a generally improved typography and appearance. It contains Washington Matthews's article on the curious "Navajo Gambling Songs," and especially the melodies which accompany the winter game of Kesitcè; Otis T. Mason's examination of the beginnings of the carrying industry, an illustrated article; "On Alternating Sounds," by Franz Boas; "Folk-Lore of the Siletz Indians," by J. Owen Dorsey; a summary of current methods of voting, by James H. Blodgett; and a variety of original notes and news. The feature of this quarterly which will excite most attention is the first instalment of a bibliography of anthropologic literature, by Robert Fletcher, who has undertaken the

valuable service of preparing a similar compilation for each number.

— So strong a feeling has been manifested in this country against the publication of a cheap pirated edition of Professor Bryce's noble work on "The American Commonwealth," says the *New York Tribune*, that it is hardly possible that any publisher will undertake it. The *Boston Advertiser* says, "Professor Bryce's materials were gathered by the most patient, candid, and acute inquiry in this country, and represent many years of labor on his part and that of his American assistants. He has made admirable use of them in the preparation of a work universally recognized as a monument to our Commonwealth, and of the foremost importance to all students of our institutions and people. For such a monograph the nation cannot afford to show itself ungrateful. If a publisher attempts to put an edition of this work on the market to defraud the author and discredit the nation, his attempt should be pilloried as peculiarly disgraceful, and the edition should be boycotted by honest book-buyers."

— E. Hollenshade, 136 Lake Street, Chicago, has published what he calls a "gored map" of the northern and southern hemispheres, which is a novelty well worthy the attention of educators and students. It is designed to obviate the necessity of a globe in the study of geography, and conveys an adequate conception of the exact relations borne by one portion of the earth's surface to every other.

— Messrs. Longmans & Co. are about to publish in New York two new books of fiction. One is "A Nine Men's Morrice, Stories Collected and Recollected," by Mr. Walter Herries Pollock, the editor of the *Saturday Review*. Most of these striking stories have a tinge of the supernatural. The other book is "A Dangerous Cat's-paw," by D. Christie Murray, and his brother Mr. Henry Murray. This is at once a story of ingenuity and mystery, with the robust humanity common to Mr. Murray's other novels.

— "Chancellor Chess, or The New Game of Chess," by Ben. R. Foster, A.M., chess editor of the *St. Louis Globe Democrat* for more than ten years, is announced as in press. Seventy pages are devoted to the new piece called "The Chancellor," containing a history of its origin, "with forty problems, and a number of games illustrative of its beauties, powers, and possibilities." It is published by the author, in St. Louis, Mo.

— Charles Scribner's Sons published last week "The History of the Roman Republic," abridged from the history of Professor Mommsen, by C. Bryans and F. J. R. Henty, which presents the salient points of the original in a form suitable for use in schools and colleges and for the convenience of the general reader; "The English Restoration and Louis XIV., from the Peace of Westphalia to the Peace of Nimwegen," by Osmund Airy, in the Epochs of Modern History Series; and "The Validity of Non-Episcopal Ordination," the Dudleian lecture, by Professor G. P. Fisher.

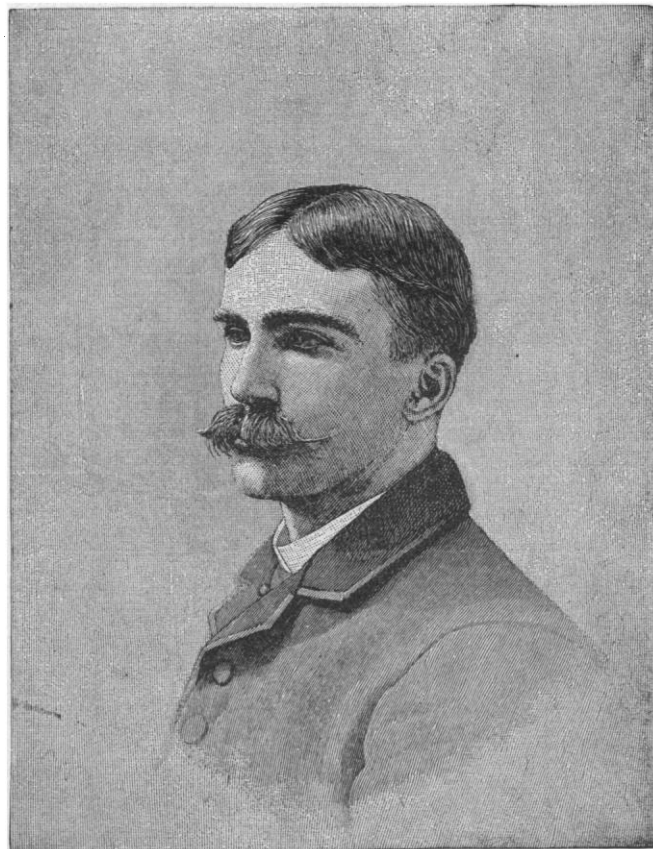
— Scribner & Welford have just issued a new edition of Barry E. O'Meara's "Napoleon at St. Helena," in two volumes, with numerous illustrations in colors and black and white. A refutation of Croker's diatribe which appeared in 1822, and a Napoleon calendar, have been added by the editors. They have also just ready a new edition of D'Anvers' "History of Art;" a new edition, in the Ideal Series, of "Sartor Resartus," with an etched portrait of Carlyle; an *édition de luxe* of "Kensington, Picturesque and Historical," by W. J. Loftie, with upwards of 300 picturesque and delicate illustrations by W. Luker, jun.; and the first volume of Professor Franz Delitzsch's "Commentary on the Book of Genesis," of which this house (by special arrangement of the author) is publishing a translation of the fifth edition, thoroughly revised, and in large part rewritten.

— According to *The Publishers' Weekly*, the new departure of the New York *Ledger* attracts much notice. Mrs. Burnett and Mr. Stevenson are engaged to write for the *Ledger*, and in the current number a learned paper by Dr. McCosh is found beside some very lurid fiction.

— *The American* states that Collier's *Once a Week* is a sort of eagle among the doves. It is said to offer "rates" to the most

popular writers, such as the magazines, with all the pressure of competition, decline to pay, and to threaten a consequent monopoly of much of the high-priced talent. Its liberality confounds the older journals.

— Mr. Thomas Stevens, whose ride around the world on a bicycle is known to all, is now on his way to find Stanley, sent through the enterprise of the *New York World*. We reproduce this week his portrait. Mr. Stevens's famous ride stands unequalled in the history of travel, and his own story of it, in "Around the



Yours sincerely
Thos Stevens

World on a Bicycle" (published by Charles Scribner's Sons) is told in a manner which charms the reader from the beginning. His escapes from death were marvellous, and thrilling incidents were daily occurrences; and his narrative of them shows him to be as good a writer as wheelman. The work contains over 200 illustrations. The work is divided into two volumes,—"From San Francisco to Teheran," and "From Teheran to Yokohama." The volumes are, however, sold singly.

— From among the several hundred books published during 1888 by J. B. Lippincott Company, we note the following as likely to be of special interest to our readers, aside from works of fiction: "The Animal Life of Our Sea-Shore," by Angelo Heilprin (fully illustrated); "Beethoven," a memoir, by Elliott Graeme, with an introductory essay by Dr. Ferdinand Hiller; "Béranger's Songs and Poems," selected by W. S. Walsh (with steel plate illustrations); "Botany," for academies and colleges, by Annie Chambers-Ketchum (250 illustrations); "Boys' Own Book of In-door Games and Recreations," edited by G. A. Hutchison (over 700 illustrations); "Chambers's Encyclopædia," Vols. I. and II., edited and published under

the auspices of W. and R. Chambers, Edinburgh, and J. B. Lippincott Company, Philadelphia, entirely revised and rewritten, complete in ten volumes, to be issued at intervals; "The Chemical Analysis of Iron," by Andrew Alexander Blair (illustrated); "The Complete Works in Verse and Prose of Percy Bysshe Shelley," edited, prefaced, and annotated by Richard Herne Sheppard, each volume complete in itself, in sets of five volumes; "Diseases of the Skin," a manual for practitioners and students, by W. Allan Jamieson, M.D. (illustrated with woodcuts and colored plates); "Embroidery and Lace," by Ernest Lefèvre, translated from the French (with about 150 illustrations); "Francis Bacon, his Life and Philosophy," by John Nichol; "Girls' Own In-door Book," edited by Charles Peters (over 150 illustrations); "Half-Hours with the Best Foreign Authors," translations selected and arranged by Charles Morris, four volumes; "Hand-Book of Games," new edition, comprising whist, draughts, billiards, etc., edited by Henry G. Bohn; "Highways and Horses," by Athol Maudsley (with numerous illustrations); "Inebriety: its Causes, its Results, its Remedy," by Franklin D. Clum, M.D.; "Insects Injurious to Fruits," by William Saunders; in the International Statesmen Series, edited by Lloyd C. Sanders, "Lord Beaconsfield" (by T. E. Kebbel), "Viscount Palmerston" (by Lloyd C. Sanders), "Prince Metternich" (by Col. G. B. Malleson, C.S.I.), "O'Connell" (by J. A. Hamilton, fellow of Magdalen College, Oxford), "Lord Bolingbroke" (by Arthur Hassall), and "Peel" (by F. C. Montague); "Intracranial Tumors," by Byron Bramwell, M.D. (116 illustrations); "Jesus in Modern Life," by Algernon Sydney Logan; "Laconisms, the Wisdom of Many in the Words of One," by J. M. P. Otts, D.D.; "Large Fortunes; or, Christianity and the Labor Problem," by Charles Richardson; "Life of Lamartine," by Lady Margaret Domville (with portrait); "The Life of the Right Hon. W. E. Forster," by T. Wemyss Reid, two volumes (with portraits and other illustrations); "Memoirs of Count Grammont," by Anthony Hamilton, edited with notes by Sir Walter Scott (with portrait of author, and 33 etchings by L. Boisson, on India paper); "Modern Science and Modern Thought," by S. Laing (fifth edition); "Paradoxes of a Philistine," by William S. Walsh; "Patriotic Reader," by Henry B. Carrington; "A Popular History of Music, Musical Instruments, Ballet, and Opera, from St. Ambrose to Mozart," by James E. Matthew (150 illustrations); "Spinoza," by John Caird, principal of Glasgow University (with portrait); "Tenure and Toil; or, Rights and Wrongs of Property and Labor," by John Gibbons; "Therapeutics: its Principles and Practice," by H. C. Wood, M.D. (new seventh edition); "A Treatise on Mine-Surveying, for the Use of Managers of Mines and Collieries," by Bennett H. Brough (with numerous illustrations); "Two Centuries of Irish History, 1691-1870," with introduction by James Bryce, M.P.; "United States Dispensatory," new sixteenth edition, by H. C. Wood, M.D., Joseph P. Remington, and Samuel P. Sadtler; "Untrodden Paths in Roumania," by Mrs. Walker (with 78 illustrations); "Walks in Palestine," the letterpress by H. A. Harper (illustrated by 24 photogravures from photographs taken by C. V. Shadbolt, Esq.); "With the Camel Corps up the Nile," by Count Gleichen, nephew of Queen Victoria (with numerous illustrations); "Worcester's New Academic Dictionary," entirely new edition, the etymology of words a distinctive new feature, reset from new type, and printed from new plates; "Worcester's New Comprehensive Dictionary," entirely new edition, containing over 48,000 words in common use, with an appendix of 15,000 proper names, new illustrations, reset from new type, and printed from entirely new plates; and "The Writer's Handbook, a Guide to the Art of Composition," forming a new volume of the Reader's Reference Library.

— Houghton, Mifflin, & Co. will shortly publish a volume of the late Asa Gray's reviews of botanical literature during the past fifty years, selected and edited by Professor C. S. Sargent.

— F. W. Christern, New York, will be the American agent of Santa-Anna Nery's elaborate work on Brazilian folk-lore, recently published in Paris. The book has a preface written by Prince Roland Bonaparte.

— *The Chautauquan* for February contains, among other things, "Gossip about Greece," by J. P. Mahaffy of Dublin University; "Socrates," by Thomas D. Seymour of Yale University; "Greek

Art," by Clarence Cook; "Music among Animals," by the Rev. J. G. Wood; "Taxation," by Professor Richard T. Ely of Johns Hopkins University; "Hospitals," by Susan Hayes Ward; "The Power-Loom," by Charles Carleton Coffin; "A Summer Meeting in Oxford," by Herbert B. Adams; "The City of the Sultan," by Eugene L. Didier; "The Modern Migration of Nations," by Hjalmar Hjorth Boyesen; "Petroleum in Russia," by P. de Tchihatchef; "The Carlisle Indian School," by Frances E. Willard; "Robert Elsmere: An Open Letter from the Rev. Lyman Abbott"; "The Sons of Eminent Men in Office," by Mrs. Carl Barus.

— A prospectus of a monthly magazine to be called *Poet-Lore*, and to be devoted solely to the illustration of Shakspeare and Browning, and to the comparative study of poetic literature, has just been issued. It is signed by Charlotte Porter, late editor of *Shakespeariana* (from August, 1886, to December, 1888), and Helen A. Clarke, whose address is 223 S. 38th Street, Philadelphia. Dr. W. J. Rolfe will contribute to its study department a series of questions and helps for the study of Shakspeare's plays, beginning in the February number with "Love's Labor's Lost," and continuing with later plays. The "Explanatory Index to Allusions in Browning's Pauline," given in the January number, will be continued through the later poems. Dr. Horace Howard Furness' lectures on Shakspeare, delivered at the University of Pennsylvania, will appear in extracts made by Dr. Furness for this publication. W. H. Wyman's "Bacon-Shakspeare Bibliography" will be continued from the December number of *Shakespeariana*. "Browning's Poetic Form," a seminary (Johns Hopkins) lecture, by Professor A. H. Smyth; "Shakspeare's Verses in Chester's Love's Martyr," by Professor William T. Harris of the Concord School of Philosophy; "French and English Literature of Elizabeth's Day," by Professor M. W. Easton; and other contributions by Professor Hiram Corson of the Cornell University, Dr. H. L. Wayland, Michel N. Damiralis of Athens, Talcott Williams, and others, — are promised.

— D. C. Heath & Co. will put on the market shortly a series of games and charts for home and school use, based on the most approved principles of kindergarten training, prepared by Mme. Warwedel, the distinguished kindergartner of San Francisco, formerly of Washington. They have also nearly ready Scott's "Lay of the Last Minstrel," edited and annotated by T. E. Wetherell.

— G. P. Putnam's Sons will publish at once "The Pocket Gazetteer of the World," a dictionary of general geography, edited by J. G. Bartholomew, uniform with the "Pocket Atlas"; "The Nursery Lesson-Book," a guide for mothers in teaching young children, with illustrations in outline and a selection of songs set to music, by Philip G. Hubert, jun.; "Principles of Procedure in Deliberative Bodies," by George Glover Crocker; and three volumes of poetry, — "The Rose of Flame, and other Poems," by A. R. Aldrich; "Idyls of the Golden Shore," by H. Maxwell; "Mastor, a Drama," by John Ruse Larus.

— Charles C. Soule has just published a volume entitled "The Australian Ballot System, as embodied in the Legislation of Australia, Europe, and the United States," — a compilation of the ballot acts of South Australia, Queensland, Great Britain, Belgium, Kentucky, New York, and Massachusetts, with portions of the same of Tasmania, New Zealand, West Australia, Victoria, New South Wales, Dominion of Canada, Ontario, Quebec, Luxemborg, Italy, and other countries, with an historical introduction and cuts and diagrams.

— A prize of fifty dollars is offered by *The Academy* for the best essay on "English in Secondary Schools." The increased prominence of English in school programmes, and the lack of any generally accepted plan or system of work, have prompted the editor of *The Academy* to offer this special inducement to those who have devoted thought to the teaching of English, and who have definite ideas of the method of such teaching. The essays may be upon the teaching of English literature, methods of grammatical study, composition work or rhetoric, etc., but no weight will be attached to arguments in favor of teaching English. Contestants must confine themselves simply to practical exposition of results sought, and of the means of attaining these results in the schoolroom. While

literary merit will not be disregarded, the decision of the judges will rest mainly on the practical help afforded to teachers by the article. The competition is open to all persons, without regard to age, sex, color, or previous condition of servitude. The following are the conditions: No paper is to exceed in length 5,000 words; the paper awarded first prize by the committee shall become the property of *The Academy*; any papers of special merit, which may receive honorable mention, shall also become the property of *The Academy*; papers must be legibly written, so as to be published without copying, must be signed with a fictitious name (the real one being enclosed in a sealed envelope), and must be received at the office of *The Academy* on or before April 15, 1889. Manuscripts not receiving prize or honorable mention will be returned if stamps are enclosed. The names of the committee of award will be published. If further information is desired, address *The Academy*, Syracuse, N.Y.

— Dr. J. M. Toner of Washington has just brought out, in a handsome brochure, "Washington's Rules of Civility and Decent Behavior," found among the early writings of the first President, and now published in full, from the original text. They make thirty-four pages, and are believed by Dr. Toner to be an original compilation made when the compiler was only thirteen years old.

— Messrs. Belford, Clarke, & Co. will remove to new quarters Nos. 18-22 E. 18th Street, New York, about the 1st of February.

— We have received the third volume of the "Transactions and Proceedings of the Modern Language Association of America," being an account of the meeting held in Philadelphia in December, 1887, with the papers there read. The different essays, fifteen in number, are on a great variety of topics, but we can only notice a few of them. Some, indeed, are so technical that but few persons can enjoy or even understand them; while one or two were read only in part, and some that were read are not yet published. Of those before us, one of the most generally interesting is the opening one, by Mr. James MacAlister, on "The Study of Modern Literature in the Education of our Time." The author takes extreme ground in favor of modern literature as against the ancient, holding that "the literatures of the modern world are entitled to the first place in the intellectual culture of our time, and should therefore be made the chief instruments of literary training in the schools." Of course, the general sentiment of the meeting was with him in this opinion; but lovers of the classics will perhaps think that the question cannot be so summarily disposed of. Another paper of general interest is that of Professor Kroeh, on "Methods of Teaching Foreign Languages." The author reviews the various methods that have been employed, and pronounces in favor of the "natural" or conversational method; but, in the course of the discussion that followed, Professor Leidensticker suggested, that, though the "natural" method was best for giving a speaking knowledge of a foreign tongue, the grammar and reader were better for imparting a reading knowledge of it. Other papers read were on "The Style of Anglo-Saxon Poetry," on "Lord Macaulay's English," and other literary themes; and others still, on strictly philological subjects, such as "The Origin of the Teutonic Weak Preterite;" but these we can only allude to. There were also some essays with a distinctly local flavor; in particular, one by Professor Fortier on "Louisiana Folk-Lore," and another by Professor Primer on "Charleston Provincialisms;" both of which will be interesting not only to philologists, but to many others. It seemed to be the sentiment of the members present that the study of such local themes is specially incumbent on American philologists, the more so because local and dialectical peculiarities are fast disappearing under the influence of the common schools. The essays as a whole betray two distinct tenden-

cies, — the philological and the literary; or, in other words, the scientific and the æsthetic; and in some of the discussions that followed the reading of each paper these two tendencies came into collision. There seems, however, to have been great harmony of feeling at the meeting, notwithstanding many divergences in views. We are glad to add that the association passed a resolution in favor of repealing the tariff on foreign books; and we should be happy to record a similar act on the part of Congress.

— Miss Dora Wheeler, the well-known decorative artist, has given much of her spare time during the past two or three years to painting, either in pastel or oils, a series of portraits of authors here and abroad, many of whom are numbered among her personal friends. Unfortunately several of those of English authors who had given her sittings during her stay in London, in 1886, including Mrs. Thackeray Ritchie, Mr. Walter Besant, Mr. Thomas Hardy, and Mr. Austin Dobson, whose further acquaintance the American public is always glad to make, were lost in transit. Since that time her sitters have been exclusively American authors; and she has finished, or nearly finished, portraits of Mrs. Stowe, Mrs. Burnett, Mr. Lowell, "Mark Twain," Mr. Warner, Mr. Howells, Mr. Aldrich, Mr. Stockton, Mr. Burroughs, Walt Whitman, and others. The interesting announcement is made that these portraits will be given as frontispieces through the year for *The Literary News*, New York. Mrs. Stowe is portrayed in the January number, and Mrs. Burnett will be given in that for February.

— Ensign Hayden's nautical monograph No. 5, just published by the Hydrographic Office, is a graphic and picturesque report of the famous March blizzard. It is illustrated with four maps showing the advance and culmination of that extraordinary atmospheric convulsion.

— Mr. von Lindheim, an Austrian engineer, has compiled the statistics of street railroads in Europe. The development of such roads dates back not more than fifteen or twenty years. In England, France, Germany, Belgium, Holland, Austria, and Switzerland there are 221 cities having street-railroads. Among these, 118 are in England, 43 in Germany, and 23 in France, there being no city of less than twenty thousand inhabitants having such roads, while in the United States they are found in cities of not more than one thousand inhabitants. In Europe there existed in 1886-87 4,330 miles of street-railroads, while the United States had 5,932 miles. England had 883 miles on which 416,518,423 passengers were carried. In Germany 245,657,503 passengers were carried on 523 miles of road. In England 472,356 passengers were carried over each mile; in Germany, 468,874; in France, 545,815. There were 3,345 street-cars in Germany, 3,494 in England, and 2,780 in France, against 22,940 in the United States. In the latter, 92,203 horses, 12,217 mules, and 248 locomotives were in use on street-roads. Of considerable interest is the comparison of distance travelled each day by the horses. In Berlin a horse gives an average of 16.1 miles; in Posen, even as much as 16.7 miles; in Vienna, 14.5 miles; in Paris, 9.9 miles; and in Hamburg, 13.7 miles. The use of mechanical motors in place of horses is steadily increasing. It is particularly desirable in those places where the daily variations of traffic are considerable. In Berlin, for instance, the Sunday and holiday traffic is 27 per cent of the whole, and in Vienna even amounts to 34 per cent, while on Wednesday the street-cars are very little used. Mr. von Lindheim is a strong advocate of the use of electric traction in street-railroads, and states that in Europe the cost of horse-traction is 1.47 if that of electric traction is assumed as 1.

— Ticknor & Co. announce among their January books, "Steadfast," by Rose Terry Cooke; "Great Captains," by Col. Theodore Ayrault Dodge, U.S.A., — a series of six lectures delivered before

THE MOST PRACTICAL AND POPULAR OF THE
MANY EXCELLENT TEXT-BOOKS RECENTLY PUBLISHED ON THIS SUBJECT.

Published less than one year ago, and already adopted for use in a large number of the leading High Schools, Normal Schools, Seminaries, Academies, etc., of the country.

MOWRY'S STUDIES IN CIVIL GOVERNMENT.

INTRODUCTORY PRICE, 94 CENTS.

SILVER, BURDETT & CO. Publishers, 50 Bromfield St., Boston.

NEW YORK: 740 & 742 Broadway.

CHICAGO: 122 & 124 Wabash Ave.

"Mowry's 'Studies in Civil Government' is the best book yet on the subject," A. S. Roe, Principal of High School, Worcester, Mass.

A sample copy will be mailed to any teacher for examination on receipt of Introductory Price (94 cents). Examine Mowry's 'Studies in Civil Government,' before beginning with another class.

the Lowell Institute, Boston, in 1889, devoted to Alexander, Hannibal, Cæsar, Gustavus Adolphus, Frederick, Napoleon, and the record of their achievements and the analysis of what each of them contributed to military science; "Ancient and Modern Light-Houses," by Major D. P. Heap, Corps of Engineers, U.S.A.; a new edition of "Discourses on Architecture," by E.-E. Viollet-Le-Duc, richly and copiously illustrated with hundreds of steel engravings and woodcuts, translated from the French by Benjamin Bucknall; a new and cheaper edition of "A Hand-Book of Christian Symbols and Stories of the Saints, as illustrated in Art," by Clara Erskine Clement and Katherine E. Conway; and "His Two Wives," a novel, by Mary Clemmer, being No. 50 of Ticknor's Paper Series.

LETTERS TO THE EDITOR.

*.*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

Dew-Point and Predictions of Weather.

ONE of the most serious drawbacks to a discussion and utilization of humidity records has been the lack of proper observational methods, and also of tables of reduction. As late as 1884 we find in Guyot two distinct tables for reducing observations with the psychrometer (the usual instrument for determining humidity) which give results differing by more than sixty degrees at extreme dryness. Perhaps nothing can indicate better the hopelessness, as late as 1887, of nearly all attempts at solving the problem of the relation between the dry and wet thermometers and the dew-point, than the announced determination of the meteorological committee to omit a table for the psychrometer from their compendium of tables for international use. It will be generally admitted that such a table is the most important and most needed of any in meteorology. The most serious difficulty in nearly all investigations has been a lack of ventilation of the psychrometer.

In September, 1883, the sling psychrometer, which combines all the admirable qualities of perfect ventilation and accuracy, great speed of action, and extreme portability, was adopted in this country.¹

With this the true relation between the quantities mentioned above was determined in 1884, and published in February, 1885; and this has been used in the latest tables, leaving nothing now to be desired except observations to check the formula at extreme dryness, such as does not occur east of the Rockies.

I propose to discuss a few recent observations with the sling psychrometer. It might be a question as to the best form in which to study the moisture of the air. The relative humidity, the difference between the dew-point and air temperature, the dew-point itself, the absolute humidity, and the vapor pressure, have all had advocates. It may be remarked that the second of these, being a deduction from two quantities which are often rapidly varying in opposite directions, seems a little uncertain. The fourth and fifth are similar to the third.

The following propositions regarding the dew-point are set forth: 1. The diurnal change in air temperature does not affect the dew-point; 2. The temperature change from day to day does not change the dew-point; 3. The air temperature is generally very near the dew-point at sunrise, and farthest from it at 2 or 3 P.M.; 4. The air temperature in its fluctuations from day to day follows the dew-point; 5. Direction and velocity of the wind do not in general affect the dew-point; 6. The same may be said of fluctuations in air-pressure; 7. The most marked rise in the dew-point occurs on the approach of a storm having an abundance of rain and during rain itself (the time of beginning and ending of rain cannot be foretold from the dew-point); 8. The most marked fall in the dew-point is caused by the advance of a high area, as was to be expected; 9. The most marked feature of the dew-point is its constancy, though at times it has a range in several days far greater than the air temperature, yet it quickly recovers from a fall

¹ My attention has just been called to the use of a sling psychrometer by Espy in Philadelphia in 1834. His results, which were not entirely satisfactory, were far ahead of his time, and till quite recently exceeded in accuracy all others since. As is so often the case, they seem to have attracted little or no attention.

or rise to a normal position, depending on the season and other general causes; 10. The dew-point is the same in all parts of a quite extended region.

The fourth of these is one of the more important, and seems to follow from the third. We have usually been taught that the air temperature on a clear night will continue to fall till the dew-point is reached, when there will be condensation of moisture, and liberation of latent heat, which will prevent the further fall in temperature; but it will be found, that, except after a long rain and in a fog, the air temperature never reaches the dew-point. Very often on clear nights the latter falls, and draws the former after it. If this proposition can be established, there may be a chance to predict changes in air temperature from the dew-point, though they are very close together.

On many accounts the seventh proposition is the most interesting of all. Does the atmosphere in this case gradually sink down? This usually would *increase* the dryness. The wind does not appear to carry the moisture, for this steady rise occurs in a calm. Moreover, the direction of the wind, as coming from the earth's surface, makes little or no difference. It is very evident that the dew-point cannot be used in predicting rain. Under the eighth proposition it should be noted that the fall in the dew-point ceases in a few hours, and long before the pressure has reached a maximum. The figures from which these propositions arise will shortly be published elsewhere. It would be gratifying if others are stimulated to make similar research.

H. A. HAZEN.

Washington, Jan. 16.

Horns of the Prong-Buck (*Antilocapra*).

THE other evening, while reading an article on the *Artiodactyla*, by Professor Cope, in the *American Naturalist* for December, 1888, I was much surprised at finding the following note: "Antilocapra is sometimes separated from the Bovidae as the type of a family, because it is said to sometimes shed its horn-sheath. This character, *were it really normal*, has no significance sufficient for the establishment of a family division" (Italics mine).

This doubt as to the shedding of the horn-sheath was so entirely foreign to what I had been led to believe, both by observation and reading, that I took the pains to look over what little literature I possess touching the subject; and, finding it so uniformly in favor of the shedding theory, I write, asking if your readers can give any additional facts in the case.

Owen (*Anatomy of Vertebrates*, London, 1868, vol. iii. pp. 626, 627) gives a description of the shedding of the horns, and growth of new ones, noticed by Mr. Bartlett in the Zoölogical Gardens of London in 1865; also notes of Dr. Canfield at Monterey, Cal., from 1855 to 1857, on a young male in captivity. Dr. Canfield is also quoted: "In the months of December and January I have never killed a buck with large horns; and at that time of the year all the bucks appear to be young ones, because their horns are so small; whereas in the spring and summer months almost all the bucks appear to be old ones, for their horns are then large and noticeable." Dr. Canfield also states that "in the summer months the line of demarcation between the horn and skin from which it grows is very apparent and abrupt; whereas in winter there is no demarcation, the horn being very soft at its base, and passing insensibly into cuticular tissues, and the horny substance being covered thinly with hair."

Gill (*Arrangement of the Families of Mammals*, Washington, 1872, p. 72) says of *Antilocapridæ*: "Horns deciduous, peculiar to the rutting-season (in both sexes), developed as pseudocorneous sheaths, with agglutinated hairs on osseous cores originating from the frontal bones." Gray (*Hand-List of the Edentate, Thick-skinned, and Ruminant Mammals in the British Museum*, London, 1873, p. 135) evidently believes in this shedding, because he places *Antilocapra* under a separate sub-order, *Dicranocera*, instead of merely a separate family. Mivart (*Lessons in Elementary Anatomy*, London, 1883, pp. 245, 246), on ecdemonic appendages, says, "and only in an anomalous form, the prong-buck (*Antilocapra*), are these horny structures shed at intervals;" Huxley (*A Manual of the Anatomy of Vertebrated Animals*, New York, 1883, p. 327), "But in the remarkable prong-horned antelope of North America (*Antilocapra*) the horny sheath is annually shed,

Publications received at Editor's Office, Jan.
7-19.

- BALZAC, H. de. Louis Lambert. Tr. by Katherine P. Wormeley. Boston, Roberts Bros. 258 p. 12°. \$1.50.
- CORY, C. B. The Birds of the West Indies. Boston, Estes & Lauriat. 324 p. 8°.
- LANGLEY, S. P. Address of, at the American Association for the Advancement of Science, at the Cleveland meeting, August, 1888. Salem, Pr. 23 p. 8°.
- NATIONAL Geographic Magazine, The. Vol. I. No. 1. Washington, Nat. Geogr. Soc. 98 p. 8°. 50 cents.
- NEW YORK State Museum of Natural History. Forty-first Annual Report of the Trustees of the, for the Year 1887. Albany, State. 390 p. 8°.
- PALMER, C. T. Artificial Persons. A Philosophical View of the Law of Corporations. Chicago, Open Court Publ. Co. 16 p. 12°.
- PETER, R. Chemical Report of the Coals, Soils, Clays, Petroleum, Mineral Waters, etc., of Kentucky. (Geol. Surv. Ky., Vol. A. Part III.) Frankfort, Ky., State. 171 p. 8°.
- U. S. GEOLOGICAL SURVEY. Topographical Maps of Portions of Alabama, Georgia, Kansas, Missouri, Massachusetts, South Carolina, Tennessee, Texas, Virginia, and West Virginia. 16 maps, 42 by 50.5 cm. Washington, Government, 1889.
- WICKSTEED, P. H. The Alphabet of Economic Science. Part I. Elements of the Theory of Value or Worth. London and New York, Macmillan. 142 p. 16°. 60 cents.
- WILLIAMS, A., Jr. Useful Minerals of the United States. Washington, Government. 812 p. 8°.
- YOUNG, C. A. A Text-Book of General Astronomy for Colleges and Scientific Schools. Boston and London, Ginn & Co. 551 p. 8°. \$2.40.

16 PAGES. THREE 16 PAGES.

Hundred Thousand new subscribers for The Family Journal and Ladies' Companion wanted. It is the most interesting and instructive paper ever issued. Subscribers will receive during the coming twelve

MONTHS

novels written by American Authors, complete in each three numbers. The story of popular works of fiction will be retold by a novel reader, the most interesting and unique feature ever introduced in any publication, giving the substance of popular and standard books by famous writers in a space easily read by the busiest people. We have engaged

FOR

this work a widely known and popular writer. Comments on Current Events, Fashions, New and Original Ideas and Designs for Ladies' Fancy Work and Household Decoration, Letters from Correspondents and their Answers. The colleges and seminaries of the United States will be treated one each month in an illustrated article, showing the particular advantage of each, cost of attendance, etc. Invaluable to parents having sons or daughters whom they desire should receive the advantages of a higher education than the ordinary school affords. Articles on Painting and Drawing, giving home instruction by a well-known artist. A trial subscription of this elegant paper will be sent to any address, three months, for

TEN CENTS.

Liberal pay for literary work adapted to our columns, and for new and original drawings, designs and ideas on any subject which we can use.

Premium List the most complete in the world. We offer inducements to club raisers and agents approached by no other publishing house. The celebrated Gilbert Cut Waist Linings, which we send post paid to any one sending us two yearly subscribers at 50 cents each is alone worth 75 cents.

Sent to any address, postpaid one year, 50 cents; six months, 25 cents, and a three months' trial subscription for only 10 cents.

TRY IT! TRY IT! TRY IT!

and you will become a permanent reader. Address:

**John L. Douglass, Publisher,
322 Broadway, N. Y.**

A TEMPORARY BINDER

for Science is now ready, and will be mailed postpaid on receipt of price.



Cloth - - - 50 cents.
Half Morocco - - 75 cents.

This binder is strong, durable and elegant, has gilt side-title, and allows the opening of the pages perfectly flat. Any number can be taken out or replaced without disturbing the others, and the papers are not mutilated for subsequent permanent binding. Filled in this binder, Science is always convenient for reference.

**N. D. C. HODGES,
47 Lafayette Place, New York.**

THE American Bell Telephone COMPANY.

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30, 1877, No. 186,787.

The Transmission of Speech by all known forms of ELECTRIC SPEAKING TELEPHONES infringes the right secured to this Company by the above patents, and renders each individual user of telephones, not furnished by it or its licensees, responsible for such unlawful use, and all the consequences thereof and liable to suit therefor.

ELECTRICAL TESTING BUREAU,

Johns Hopkins University, Baltimore, Md.

Resistance Coils and Boxes Compared.

Am meters and Volt meters calibrated.

Condensers standardized.

Primary and Secondary Batteries Tested.

Efficiency of Dynamos and Motors Determined.

Insulation of Cables and Wires Tested.

Etc., Etc.

Circulars describing Methods Used, Prices,

Etc., sent on Application.

Address as above.

R. ELLIS & CO.

BUSINESS, HOTEL AND PATENT BROKERS,

AUCTIONEERS, ETC.

No. 176 BROADWAY,

Room 46.

New York.

CLIENTS Advised free of charge.

ESTABLISHED 1859.
H. A. DREW,
Commercial Printer,
5 Clinton Place, near Broadway,
New York.

Wedding Orders, Souvenirs, Invitations, Orders of Dance, etc., etc., done in the latest and most elaborate styles, at reasonable prices.
All Favors promptly attended to.

SCIENCE CLUBBING RATES.

10% DISCOUNT.	Year's Subscription.	With Science.	With The Swiss Cross.
We will allow the above discount to any subscriber to Science or The Swiss Cross who will send us an order for periodicals exceeding \$10, counting each at its full price.			
American Agriculturist.....	\$1.50	\$4.30	\$2.50
American Analyst.....	1.00	4.25	2.25
American Architect and Building News.			
Imperial edition.....	10.00	12.80	11.00
Gelatine ".....	7.00	9.80	8.00
Regular ".....	6.00	8.80	7.00
American Garden.....	1.00	4.25	2.25
American Journal of Philology.....	3.00	6.25	4.25
American Machinist.....	2.50	5.30	4.50
American Magazine.....	3.00	5.80	4.00
American Naturalist.....	4.00	7.50	5.50
Andover Review.....	4.00	6.80	5.00
Atlantic.....	4.00	6.80	5.00
Babyhood.....	1.50	4.30	2.50
Babyland.....	.50	3.75	1.75
Bradstreet's.....	5.00	7.80	6.00
Brain.....	3.50	6.30	4.50
Building (weekly).....	6.00	8.80	7.00
Carpentry and Building.....	1.00	4.25	2.25
Century Magazine.....	4.00	6.80	5.00
Chautauquan, The.....	1.50	4.30	2.50
Christian Union, The.....	3.00	5.80	4.00
Christian Weekly, Illustrated.....	2.50	5.30	3.50
Cosmopolitan, The.....	2.00	4.80	3.00
Critic.....	3.00	5.80	4.00
Doctor.....	2.00	4.80	3.00
Eclectic Magazine.....	5.00	7.80	6.00
Edinburgh Review.....	4.00	6.80	5.00
Electrical World.....	3.00	5.80	4.00
Electrician and Electrical Engineer.....	3.00	5.80	4.00
Electrical Review.....	3.00	5.80	4.00
Engineering and Mining Journal.....	4.00	6.80	5.00
English Illustrated Magazine.....	1.75	4.55	2.75
Family Story Paper (N.Y.).....	3.00	5.80	4.00
Forest and Stream.....	4.00	6.80	5.00
Forum, The.....	5.00	7.80	6.00
Godey's Lady's Book.....	2.00	4.80	3.00
Harper's Bazar.....	4.00	6.80	5.00
Harper's Magazine.....	4.00	6.80	5.00
Harper's Weekly.....	4.00	6.80	5.00
Harper's Young People.....	2.00	4.80	3.00
Health and Home.....	1.00	4.25	2.25
Herald of Health.....	1.00	4.25	2.25
Illustrated London News (Amer. reprint).....	4.00	6.80	5.00
Independent, The.....	3.00	5.80	4.00
Inter Ocean, The.....	1.00	4.25	2.25
Iron Age (weekly).....	4.50	7.30	5.50
Journal of Philology (Eng.).....	2.50	5.30	3.50
Journal of Speculative Philosophy (begins with Jan. No.).....	3.00	5.80	4.00
Judge.....	4.00	6.80	5.00
L'Art.....	12.00	14.80	13.00
Life.....	5.00	7.80	6.00
Lippincott's Magazine.....	3.00	5.80	4.00
Littell's Living Age.....	8.00	10.80	9.00
Little Men and Women.....	1.00	4.25	2.25
London Quarterly.....	4.00	6.80	5.00
Macmillan's Magazine.....	3.00	5.80	4.00
Magazine of American History.....	5.00	7.80	6.00
Medical and Surgical Journal.....	5.00	7.80	6.00
Mechanical Engineer.....	2.00	4.80	3.00
Metal Worker.....	1.00	4.25	2.25
Microscope, The.....	1.00	4.25	2.25
Nature.....	6.00	8.80	7.00
New Princeton Review.....	3.00	5.80	4.00
North American Review.....	5.00	7.80	6.00
Outing.....	3.00	5.80	4.00
Overland Monthly.....	4.00	6.80	5.00
Pansy.....	1.00	4.25	2.25
Political Science Quarterly.....	3.00	5.80	4.00
Popular Science Monthly.....	5.00	7.80	6.00
Popular Science News.....	1.00	4.25	2.25
Portfolio, The.....	7.50	10.30	8.50
Practitioner.....	3.50	6.30	4.50
Public Opinion.....	3.00	5.80	4.00
Puck.....	5.00	7.80	6.00
Puck (German).....	5.00	7.80	6.00
Quarterly Review (London).....	4.00	6.80	5.00
Queries.....	1.00	4.25	2.25
Rural New-Yorker.....	2.00	4.80	3.00
St. Nicholas.....	3.00	5.80	4.00
School Journal.....	2.50	5.30	3.00
Scientific American.....	3.00	5.80	4.00
Supplement.....	5.00	7.80	6.00
Architect and Builders' edition.....	2.50	5.30	3.50
Scribner's Magazine.....	3.00	5.80	4.00
Southern Cultivator.....	1.50	4.30	2.50
Springfield Republican (weekly).....	1.00	4.25	2.25
Sunday School Times.....	2.00	4.80	3.00
Teachers' Institute.....	1.25	4.05	2.25
Texas Siftings.....	1.00	4.25	2.25
Treasure-Trove.....	1.00	4.25	2.25
Truth Seeker, The.....	3.00	5.80	4.00
Wide Awake.....	2.40	5.20	3.40
Young Folks' Journal.....	1.00	4.25	2.25

**N. D. C. HODGES,
47 Lafayette Place,
New York.**